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6 July 1984

# USSR Report

CONSTRUCTION AND RELATED INDUSTRIES

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## USSR REPORT

### CONSTRUCTION AND RELATED INDUSTRIES

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## CONSTRUCTION PLANNING AND ECONOMICS

### TERRITORIAL DESIGN ORGANIZATIONS INCREASE WORK PLANNING ROLE

Moscow BYULLETEN' STROITEL'NOY TEKHNIKI in Russian No 3, Mar 84 p 4

[Article: "Measures to Increase the Role and Accountability of Territorial Design Organizations in the Fulfillment of Tasks Related to the Improvement of Estimating Work"]

[Text] The board of USSR Gosstroy, after reviewing the above question on 15 December 1983, announced that certain territorial design organizations of USSR Gosstroy were not completely fulfilling their obligations in the matter of improving estimating work, improving the quality of design for enterprises, buildings and structures, or in the development of general designs for industrial centers in the pertinent economic regions and union republics.

The board of USSR Gosstroy acknowledged that it is essential to increase significantly the role and accountability of territorial design organizations of USSR Gosstroy in the implementation of the unified technical policy being pursued by the committee for design and construction in the pertinent economic regions and union republics. The board obligated the territorial design organizations of USSR Gosstroy:

--to assure the timely and high quality fulfillment of all functions included in the current Statute on Territorial Design Organizations of USSR Gosstroy;

--to improve their work on the efficient siting of industrial enterprises, buildings and structures, the hookup of the enterprises being designed to existing utilities and service lines, auxiliary production capacities and maintenance facilities;

--to upgrade continuously the technical sophistication and effectiveness of developed designs for the overall plans of industrial centers and to regulate the construction of industrial zones in cities, carrying out this work in conjunction with general city plans and the designs of regional planners;

--to participate actively in the development of territorial plans to protect the environment, and to protect the territories from dangerous geological processes;

--to review assignments for the design of industrial enterprises, buildings and structures slated for construction;

--to implement systematic monitoring over the quality of design documentation for the construction of industrial enterprises, buildings and structures, and to present the results of same to USSR Gosstroy quarterly;

--to intensify monitoring over the carrying out of resolutions adopted within the framework of overall approved plans for industrial centers.

The appropriate subdivisions of USSR Gosstroy have been delegated to develop a plan for a specific program covering:

--implementation of an entire complex of measures to increase the effectiveness of operation of territorial design organizations and strengthening their influence on the quality of construction designs;

--refinement of the Statute on Territorial Design Organizations of USSR Gosstroy;

--carry out organizational measures within territorial design organizations in order to establish divisions to perform territorial functions;

--delegate responsibilities to territorial design organizations for the conduct of scientific research on pressing design issues, as well as for the introduction of scientific breakthroughs into construction practice;

--participation of territorial design organizations in the conduct of engineering research for new construction.

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## CONSTRUCTION PLANNING AND ECONOMICS

### WAYS OF REDUCING CONSTRUCTION COSTS REVIEWED

Moscow STROITEL'NAYA GAZETA in Russian 25 Mar 84 pp 1-2

[Interview with Aleksey Grigoryevich Kuleshov, section chief of the Department of Finance, Production and Prices of USSR Gosplan, by STROITEL'NAYA GAZETA correspondent Oleg Dementin: "Strict Accounting for Every Kopeck"; date and place not given]

[Text] Production Cost of Construction Work: Consolidating a positive improvement.

Unarguable statistics testify that in recent years the growth in the volume of construction has been mainly due to a pervasive factor--growth of the gross volumes of construction and installation operations. In the 10th Five-Year Plan their overall production cost throughout the industry grew by 3 percent. The cost of each percentage point of price increase was 0.5 billion rubles. Consequently, the resources lost in these percentages would have been enough for an entire annual construction program in one of the republic ministries.

Production cost has also been growing during the 2 years of the current five-year plan, and only in the past year has any decline in it been observed. Is it possible to consolidate this positive improvement, to reach the plan benchmarks in a short time, and on this base to fulfill the obligation of further reducing production cost by 0.5 percent? What resources must be put into operation, and what management levers must be employed?

[Question] To begin with, obviously, we must clarify the bases for the problem that has arisen. What are the causes that have brought about the growth of production net cost indices in construction?

[Answer] A comprehensive paper on this topic was recently prepared by Vyacheslav Alekseyevich Balakin, deputy chief of the Department of Construction and the Construction Industry of USSR Gosplan. Between the 9th and 10th Five-Year Plans he identified a "watershed" clearly marking the boundaries of production net cost indices. Up to 1975 a vigorous process

of development was going on in the enterprises of the construction industry and in the growth of volume of construction and installation work. In the 10-year period the industry doubled the inventory of excavators, bulldozers, scrapers and cranes, tripled the value of basic production assets and increased by 50 percent the average annual size of the work force. The industry was vigorously expanding its potential. In the 10-year period labor productivity grew by 57 percent and profitability increased from 6.1 to 15.5 percent.

But even then the outlines were discernible of future difficulties. The industry as a whole was able to expand the average annual volume of construction and installation operations by a factor of two. In so doing it increased to an even greater degree the number of projects under construction at the same time that were not provided with adequate labor resources. For a long time a considerable portion of capital investment has been going into unfinished production. Under these conditions, growth rates of wages have outstripped growth rates of labor productivity.

The dissipation of capital investment foreordained difficulties in improving the structure of the construction-machinery inventory. With the oversaturation of the traditional types of low-powered units, the shortage became more apparent of efficient machines of high unit capacity and of small-scale mechanized equipment for manual labor. The system of calculations for paying for the use of equipment is not linked to the end results of production and has become one more factor in the growth of production cost indices. In the previous five-year plan expenditures for the use of machinery and mechanisms as a part of the production cost of construction and installation operations grew by 800 million rubles relative to the level of the base year.

Clearly, the quantitative factors in the industry's growth have been exhausted. Now, factors of intensive growth have come to the forefront, to which decisions of the 26th CPSU Congress and the subsequent plenums of the CPSU Central Committee have been addressed. This course was confirmed also by the February 1984 plenum of the Central Committee.

[Question] So, the concentration of capital investment, Aleksey Grigoryevich, is one of the most important conditions for improving the efficiency of construction, and reducing its production cost. But surely, the problem of concentration is to a considerable degree a problem of the client, and of his economic knowledgeability and skills in intelligently using the factors of intensive growth?

[Answer] Of course. It often happens that the client "crams" his entry into the plan with the aid of a tried method of artificially understanding the cost of construction in the technical documentation. Having defended an unrealistic plan and one unbalanced in the capacities and resources for construction operations, the client wholly shifts the responsibility for fulfilling it onto the contractor. Even such major organizations as Glavmosstroy [Main Administration for Bridge Construction] and Glavmospromstroy [Main Administration of Building Materials], which though ranking as models for a distinctive showcase organization of construction, do not escape the consequences of poor rhythm and balance in plans.

A plan unbalanced in resources and operating schedule distorts the dynamics of arriving at production-cost indices in the industry as a whole: from 14-15 percent of profitability in the second and third quarters, to 2-3 percent in the fourth, and to zero or lower in December. The total for the year thus ends up with a modest profitability index.

In 1983 an improvement in technical, labor and contract discipline, and based on this to set up a schedule for launching projects on a quarterly basis. This has made possible an increase in the profitability of contract organizations in the 4th quarter up to 5 percent--almost to the level of the planned savings. Overall the profitability index has increased by 1 percent.

Resources are far from exhausted. They must be utilized during this year as well.

I agree that the economic mechanism to prevent the dissipation of capital investment by the client during the planning stage has not been completely put in order. Under the new management conditions, a bank may not finance capital investments earmarked in violation of standard deadlines, and therefore not targeted at a program under way. But this can be done in one, two or three instances. But if the scale of the business is very broad, one cannot cut off the financing of an industry.

A specialist of a planning agency, especially of a republic, armed with an economic yardstick, must be bold, and not be afraid to cross out a questionable item from a draft plan, if it offers nothing but a mechanical "coping" with the designated task.

The client, upon his appearance at the planning agency must be more closely questioned whether he has already met with his general contractor and whether he has matched his intentions with his capabilities.

There is also a tangible need for the USSR TsSU [Central Statistical Administration] Department of Capital Construction Statistics to set up an inventory of total projects under way, that takes note of the degree of readiness and of the demand for the product that a new enterprise intends to manufacture. There will be no great harm if a client decides to sideline certain projects.

It is certain that by such coordinated efforts we can considerably move forward along the path of concentrating resources and reducing production cost in construction.

[Question] But let's switch over, Aleksey Grigoreyevich, to the construction workers themselves. To what extent does the reduction of production cost depend on their own organizing efforts?

[Answer] Let me show that by an example of the activities of the USSR Mintyazhstroy [Ministry of Construction of Heavy Industry Establishments]. In 1975 USSR Mintyazhstroy, for 1 ruble of construction and installation work, spent 90.25 kopecks for expenditures of all types. Five years later the unit index had increased by 6.15 kopecks. Each kopeck of the unit index meant 40 million rubles of additional expenditures for the ministry as a whole. What was going on here? Why was profitability going down?

There was one eloquent comparison: the level of unit expenditures was growing to the same degree as the number of new construction organizations in the ministry.

It is amazing with what ease new organizations spring up in the construction industry. It was nothing, for example to set up a separate SMU [Construction and Installation Administration] for a volume of work that one shift's general-purpose brigade could handle.

The numerical growth of low-capacity organizations working with low-efficiency technologies leads straight to losses. In 1975 each organization of USSR Mintyazhstroy performed on the average an amount of work equal to 3.03 million rubles. Four years later it was 2.75 million rubles. At the same time, the overhead related to production management grew by 10 percent, or by 100 million rubles in absolute terms. This yielded a 2.5 percent increase in the production cost of operations.

In the 10th Five-Year Plan the overhead of the construction industry as a whole grew by 17.7 percent. Just to stabilize this level by consolidating construction organizations, increasing their capacity and putting a ceiling on management-related overhead would provide an annual saving of assets in the amount of 1.5 billion rubles.

Every manager of a ministry or main administration can demonstrate broad initiative here.

In 1975, for each ruble of construction and installation work accomplished, USSR Mintyazhstroy spent 9 kopecks for the operation of machinery and mechanisms. Four years later it was 10.4 kopecks. We must remember that the cost of a standard kopeck per ministry is 40 million rubles. And here again we have one of the consequences of dissipating forces on many projects. This is the result: in the 10th Five-Year Plan the average annual output per ministry increased by 3 percent, and wages by more than 10 percent.

In this respect, USSR Mintyazhstroy has considerably tightened up the situation in the past year. However, in some of its branches, there is a deficiency, although a "very minor" one: skill in planning production around economy.

With the aid of a quota limiting expenditures per ruble of construction and installation work (as established by USSR Gosplan), managers of the planning and finance administrations of ministries and departments must even now determine what corrections to introduce into the construction plan for the current year. Work with an economic quota opens up genuine possibilities for developing reliable counterplans. Only in this way can we guarantee to the labor collectives of our branches a substantive addition to the economic incentive fund for reducing planned production-cost indices.

[Question] It is well known that reducing construction production cost also depends indirectly on savings in the wage fund. A year has passed since the industry stopped the practice of planning this fund on the level attained, and introduced a wage-fund quota per ruble of construction and installation work (NUChP) [expansion unknown]. How does it look at this time?

[Answer] The initial results are reassuring. In the local organizations, where they have become used to viewing wages as a bottomless well, they have coped well with the new situation: it turns out that wages must be earned in complete accordance between norms and rates. No matter how much wages one "piles on", a bank will not release a sum exceeding the set quota.

The quota has targeted the construction superintendent and labor engineer to fulfill the planned volume of work with minimum expenditures of labor. It is mainly a matter of increasing labor productivity.

A 1-percent increase in labor productivity in construction frees the labor of about 70,000 men per year, and reduces the production cost of operations by 180 million rubles because of savings in the wage fund.

Last year instances of overexpenditures for wages in the industry as a whole were one-half those of the year before. The total amount of the reduction of overexpenditures was 130 million rubles. If these rates are maintained, then the industry will soon be working on the principle: finished production pays for every ruble. A welcome prospect. We have become more thrifty. In so doing, no one has suffered in his personal pay. The essence of the economy measure is that wages have stimulated a reduction in labor expenditures.

But if we have already jointly crossed the most important quota boundary, does that mean that all economic worries are over? Obviously not. The main thing, and one that we have accomplished, is that we have become accustomed to discipline in expenditures and have learned to watch our kopecks for specific expenditures. The next task is to ensure a steady expansion of the degree to which the labor productivity index exceeds the wage index.

We must not slacken our efforts. There is still too much demand for unearned wages in industry today. And it must be paid for. From what sources? From those reserves which remain at the disposal of ministries and departments after a certain tightening of the quota for sub-departmental organizations. Therefore, the active and demanding role of a planning and economics service specialist of a ministry or republic department is now important as never before. An economist who makes any kind of overexpenditure from the wage fund must give notice that all is not in order. The debtor organization is obliged to take steps to lower the labor requirements of production and to repay the debt to the departmental budget.

In 1983 growth rates of labor productivity exceeding growth rates of wages were attained by USSR Mintyazhstroy, USSR Minpromstroy and USSR Minstroy [Ministry of Construction].

Still lagging behind in achieving this important economic factor are such ministries as Minvostokstroy [Ministry of Construction of the Eastern Regions], USSR Minselstroy [Ministry of Agricultural Construction], Mintransstroy [Ministry of Transportation Construction] and USSR Minenergo [Ministry of Energy]. However, the lag is not very great. It can be made up in just this year with the aid of bold application of the wage quota per ruble of construction and installation work or NUCHP.

[Question] And now, Aleksey Grigoryevich, let us look at the problem of reducing construction production cost and at the specific application and everyday importance of it. How can any specific construction project deal with this problem today, tomorrow and every day?

[Answer] In many trusts the construction and installation administration knows how to calculate production cost at the end of the reporting period, but does not know how to plan it or to turn this work into a system and reach the intended results.

One can, of course, call for economy in general. But is it still better to present a brigade with a planned production cost of operations on the base of technical and economic calculations, using progressive quotas. Then self-supporting brigades will show an interest in the economic results of the work. A strange phenomenon which can still be observed will disappear: all brigades somehow save, but the construction organization as a whole does not save anything.

It is necessary to improve the methodology of planning production-cost-indices, both of general-construction and of specialized brigades, taking account of the structure of the operations, their organizational level and of much else that the production-cost index is made up of.

Models of these methodologies have been developed in the organizations of Glavzapstroy [Main Administration for Construction in the Western Regions]. They must be studied, and where feasible, taken as a foundation. The experience of economic planning for self-supporting contract brigades should be a constant theme of departmental schools for skilled labor.

It is certain that a reduction of 0.5 percent above that planned in production cost can be realistically achieved in the current year. Dealing with this task is the honorable duty of the industry's labor collectives and of specialists in the sphere of management.

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## AGRICULTURAL CONSTRUCTION

### DEPUTY MINISTER ON AGRICULTURAL CONSTRUCTION COMBINES

Saratov STEPNYYE PROSTORY in Russian No 3, Mar 84 pp 37-40

[Article by USSR Deputy Minister of Rural Construction N. I. Svistunov: "An Industrial Base for Rural Construction"]

[Text] Raising the level of industrialization, improving the degree of factory readiness of components and items, and transforming the construction site into an assembly-installation site are of decisive importance at the present stage of rural construction. One basic way of attaining this goal has been the rural construction combines (SSK). Their primary advantage over other forms of organization and management is higher labor productivity and a significant reduction in labor intensiveness at the construction site.

At present, the USSR Ministry of Rural Construction system operates 58 rural construction combines. We plan to create another 21 before the end of the five-year plan, and there are to be 115 by 1990, including at least 60 SSK's in the Russian Federation. This will provide an opportunity to increase SSK housing construction in the RSFSR Ministry of Rural Construction to 1.6 million square meters in 1985, or more than 40 percent of all housing starts for this ministry.

The SSK is a single specialized organization with its own industrial production to manufacture components and parts and construction subdivisions operating as a single conveyor. The primary result of SSK work must be a finished project or complex which has been erected quickly, with minimal labor expenditures.

Rural combines check out advanced technological resolutions and introduce the most effective components and items. For example, current series 25 and 135 standard house plans have eliminated monolithic embedding and brick encasing, panel and partition cuts have been enlarged, room-sized outside wall panel variants have been developed, large roof slabs are available, and there are reinforced areaway, entrance roof and other elements. Thus, the number of installation elements has been reduced in the series-25 27-apartment building, while the labor intensiveness of the construction work has been decreased by 63 man-days. The next step in improving house plans was to tie in prefabricated asbestos-cement and reinforced concrete bathroom units. Their introduction reduces labor expenditures on a 27-apartment building by 54 man-days.

Unfortunately, several combines have limited themselves to manufacturing small items, building everything they have to, and acting as ordinary construction organizations in the region.

SSK specialization anticipates the construction of projects using fully prefabricated self-produced parts. But how are we doing it? Only 35 combines are using parts they produce themselves (with own consumption at 90-100 percent), with the rest being supplied by general construction organizations. Thus, the point and essence of SSK activity are lost.

There are every grounds for developing the SSK network and improving their work. But thus far, the proportion of construction-installation work being done by the combines is only six percent (296 million rubles), 1983. Only 19.3 percent (1,244,000 square meters) of the housing, 1.5 percent (80,000 square meters) of the sociocultural projects and 29.3 percent (1,433,000 square meters) of the agricultural production buildings are being put up this way. A number of combines are making little use of production capacities and opportunities for increasing work volumes. Output is growing slowly and the level of construction and industrial production remains low.

The scientific-technical council of the ministry has defined the basic frontiers for industrializing rural construction: in housing, we must reach a level of 60 percent full fabrication by 1990, in civil construction -- 45 percent, and in production construction -- 90 percent. Housing construction is to have doubled by 1990, that is, putting up 12 million square meters annually, three million square meters of which must be farmstead-type housing (in 1982, only one million square meters, total, was built). Resolution of this task is placed mainly on the shoulders of the SSK's.

This work is developing well in Saratov Oblast and a number of other places. But thus far, we are building few farmstead-type houses. They comprise only 16.7 percent of SSK output. At the same time, the level of farmstead development in rural areas must be increased to 70 percent in the RSFSR in the 11th Five-Year Plan.

In order to successfully implement this party and government assignment to build up rural areas with farmstead-type housing and the farm buildings to run private subsidiary farms, planning organizations everywhere have shifted, beginning in 1979, to developing farmstead-type standard plans for state, kolkhoz and individual construction.

In 1982, nationwide, there were 722 standard plans for one- and two-apartment houses, including 402 plans for state and kolkhoz houses and 320 for individual construction and rural housing-construction cooperatives. Some 131 plans had been worked out for farm outbuildings. Standard plans were selected for rural houses and public buildings included in local lists. The RSFSR Gosstroy has already completed this work for all oblasts and autonomous republics.

We must use the available capacities of our combines and plants more fully. At the same time, we need to systematically actualize plans for retooling, equipping and creating capacities for subsidiary-auxiliary services.

The ministry has set specific requirements for the level of factory readiness of house parts produced by SSK's. No one doubts any longer the fact that all the outside wall panels being produced must have front surfaces finished with one of various types of effective materials, or that inside panels must be painted or

wallpapered. In the RSFSR, for example, 26 of the 31 SSK's produce panels conforming to these requirements. Ten SSK's use glass-inlay carpet-tile finish and five use ceramic. A number of combines, including the Engels in Saratov Oblast, are working out new finishing methods such as "open finishes" using hardening retardants or organosilicon paints.

Extensive use is being made of relief-design decorative base panels using metallic and rubber dies. Of interest is the experience of the Engels combine, which uses reinforced concrete-on-wood finishing panels using simple wooden dies for farmstead houses.

In addition to shaping the facade and inside surfaces of room-sized outside panels, that is, single-row cross-section, SSK's producing these panels must install glass window units, drains and window sills.

However, the level of building prefabrication and factory finish of the parts by no means always meet modern requirements. Thus, labor expenditures per square meter, under factory conditions, are 0.49 man-days for single-story houses, 3.01 man-days at the construction site; for two- to four-story houses -- 0.57 man-days under factory conditions and 2.64 man-days at the construction site (RSFSR Ministry of Rural Construction as a whole). As we see, labor expenditures are four to five times higher at the construction site than at the plant. This indicates that the level of house prefabrication is very low, that many SSK's are not manufacturing partitions, bathroom units, ventilation units and other pre-finished parts. The parts being produced require final finishing at the construction site, which is absolutely impermissible.

Not all SSK's are manufacturing story-height outside wall panels, inside walls and partitions have door openings which are not framed in. Their surfaces and jambs are not finished. Unfinished elements require large expenditures of labor to finish, lay tile floors, cut openings, and so on. Bathroom units are often received in the form of many small pieces.

One sometimes encounters cases in which SSK leaders consider the release of ready, finished buildings mandatory only when working on a general contract. But if the combine is working on a subcontract, it does not do the finishing operations, shifting them to the general contractor. The SSK's must release projects on a "turnkey" basis.

If we do not shift up to 50 percent of the labor expenditures to factory conditions, the tasks of raising labor productivity and reducing construction time will not be resolved and construction quality will remain low.

There is a material base for resolving these tasks. The SSK's currently have the necessary sets of equipment, finishing lines, cassette installations and advanced technologies.

The union republic ministries of rural construction have created seven support-model SSK's entrusted with the task of being conductors of everything new and advanced, both in components and in production organization. These are the Engels (Saratov Oblast), Kalinin and Omsk SSK's in the RSFSR, the Berezanskiy in the Ukraine, the Berezovskiy in Belorussia, the Kapchagayskiy in Kazakhstan and

the Echmiadzinskiy in Armenia. Regulations have been worked out for these enterprises. Beginning next year, a plan will be approved for them not just for production and the construction of projects, but also, and foremost, for pilot-experimental work.

There are still interruptions and disruptions in material-technical supply due to shortcomings in the activity of supplier enterprises and inadequate material allocations. A decision has been made to allocate all SSK's stocks of materials under a plant production program on physical account. This will create conditions favorable to stable enterprise activity.

Rural builders and planners are doing considerable work to save materials. The SSK's have mastered the production of sets of lightweight rural-series components which will be used to build production buildings for basic and subsidiary-auxiliary production, with pillar-beam and frame structural arrangements. In this regard, along with concrete and reinforced concrete components, sets of other effective materials are also used: metal, asbestos-cement, glued wood and others. House-building combines have mastered the production of sets of components to build houses, including the series 17, 25, 135, 209 and other farmstead-type houses.

Energy conservation has been facilitated by the introduction of improved and more progressive technological processes. For example, the Engels SSK has introduced keramzit-concrete mixture preheating in the manufacture of wall panels. The steam heating is done in an updated SMZh-306 cement distributor, with subsequent heat treating in cassettes using the "thermos" method. The use of hot-concrete technology is part of the comprehensive target program for saving fuel and energy resources.

Unfortunately, these and other progressive methods and components are not being used everywhere. One frequently encounters overexpenditures of cement, metal, electricity, fuel and other materials. Take heat conservation. Nearly every enterprise has pit-type steam chambers, but they are, to put it mildly, unsatisfactorily used.

A local check showed that materials expenditure norms are not being followed in many construction organizations. Often, materials are simply squandered. In this connection, many leaders have been fined, and an interdepartmental commission has withdrawn significant amounts of materials (fuel, cement, lumber, metal and so on) from the Ministry. The USSR Ministry of Rural Construction collegium has examined these problems and established a broad range of measures.

Production organization, from planning and management to organizing socialist competition, is an integral part of all this work. The reference is foremost to introducing flow-line methods in construction, to using leading methods of labor organization, to the universal, extensive introduction of the brigade contract, for which the combined method of production offers fertile soil. The brigade contract must be transformed into a mandatory form of labor organization in both industrial and construction production. Here, the very structure of management and production is the organic medium for it.

The changeover of SSK's to a unified construction balance is of considerable help in improving work efficiency and the orientation towards end results. To

this point, 55 percent of the combines are operating on such balances. All combines are to have changed over to this system in 1985.

Proper personnel selection and placement, the training and education of specialists, and the resolution of internal social problems have taken on great importance. The experience of the Kapchagayskiy SSK is especially interesting in this regard. It is in a semi-arid zone of Alma-Ata Oblast, in Kazakhstan. In the 10th Five-Year Plan, the combine's construction-installation work volume was 8.2 million rubles. This five-year plan, it is more than 12 million rubles. Every condition has been created here for the introduction of progressive forms of labor organization, such as the integral-process brigade contract, which already covers 50 percent of the work volume. The special-effort method has also been introduced in construction in Perm and Taldy-Kurgana oblasts and at a number of projects in Alma-Ata Oblast.

It is well-understood at the combine that everything is done by people, so the working person is the center of attention there. About 2,000 people work in the SSK, including 305 communists. Seventy-seven people have a higher education, 269 have a secondary special education and 58 have a general secondary education.

Subdivision chiefs, chief specialists and mid-level line personnel are designated and removed from positions only with the concurrence of the party committee and the association building committee. This has provided an opportunity to create at the sector level party and Komsomol groups which have helped secure skilled specialists in the basic sectors. For example, party and Komsomol groups work actively in the Nonchernozem Zone, in sponsored Perm Oblast, on ideological education in the sector collective, fighting for construction assignment fulfillment and constantly monitoring fulfillment of the socialist obligations assumed. A modern study-production base has been created in the SSK study center. A study-methods council functions within the combine.

By carrying out social development plans, the combine has provided 308 families with improved housing. It built 292 apartments itself and a dormitory to house 420 young people. It has its own subsidiary farm, producing up to 240 tons of meat per year, or 120 kg per worker. Construction of a 100-head cow barn, installation of an irrigation water line and vegetable cultivation are planned. Moreover, a Stroitel cooperative of amateur gardeners, consisting of 700 plots, has been created.

The plan is to build two 80-apartment houses, a kindergarten for 280 and a dispensary on the shore of the Kapchagayskiy Reservoir in 1984-1985.

All these steps are yielding corresponding results. Whereas personnel turnover at the combine was 34 percent in 1979, there are now shops in which the collectives are stable, and there are no violations of labor discipline.

Strengthening discipline, organization and order in all areas and in all ways possible is a most important condition for successful implementation of the country's economic and social development plans, for improving the well-being of the people. Speaking at a meeting between the CPSU Central Committee and party veterans, Comrade Yu. V. Andropov noted that the essence of socialist discipline is full production from everyone. Much depends on well-posed ideological and political-education work, which must rely on modern labor organization,

the intelligent placement of people, precise material-technical supply, and perfected moral and material incentives.

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## HOUSING CONSTRUCTION

### 'MOBIL' SYSTEM OF BUILDING LARGE-PANEL HOUSING

Moscow STROITEL'NAYA GAZETA in Russian 21 Mar 84 p 2

[Article by I. Zhivotovskiy deputy chief of the Administration for the Organization of Construction, New Technology, and Economics of the State Committee for Civil Construction and Architecture: "Let's Get Acquainted With the 'Mobil' System"]

[Text] In order to speed up the construction of new cities and villages a goal was set to work out designs for quickly assembled housing construction enterprises. And such plants, with a capacity of 30,000 to 50,000 square meters of total floor space per year, were designed in the USSR Ministry of Energy's system. However, as a result of inefficient technology and a deficiency in the construction operation at these plants they were not able to start up profitable production of large-panel housing units using existing series. Their products list was excessively large and cumbersome.

The subsequent direction of the search was aimed at, first of all, working out designs for large-panel buildings having a comparatively small products list. The production of such buildings would be easier to start up at plants having small capacities.

The Kiev ZNIEP [not further identified] has worked out such designs for housing units. The system, which has been given the name "Mobil", is based on the strict standardization of all planning parameters and makes it possible to reduce the products list in comparison to existing typical designs by a factor of four to five while at the same time ensuring that urban construction demands are met.

I remember that no less than seven to ten modular sections were needed for a modern structure. In order to gear up their production using existing typical designs 500 or more types of components were required. With the "Mobil" system an equal number of modular sections can be assembled from just 90 to 120 types of components.

This was supported in practice during the construction of the first "Mobil" system housing units in Zhanatas in Kazakh SSR. Four types of five-story modular section buildings are being erected from the 82 types of components that are turned out by the new plant. Only 11 additional types of components are required in order to start up the production of three more nine-story modular section buildings.

The large-panel housing construction plant in Zhanatas was originally intended for the "97" series and was reorganized to turn out "Mobil" system housing units right during the course of construction. A practical decision gave good results. By means of a sharp reduction (by more than a factor of three) in the products list, the metal consumption for forms and edge pieces was reduced from 1100 to 550 tons at the plant. The entire products list for the plant's annual program was distributed among operating technological lines so that no reoutfitting of forms was needed during the production process.

The construction time for the enterprise was also substantially reduced. The entire route from the idea of designing the "Mobil" system to the house warmings in the first houses built by the Zhanatas DSK [Housing Construction Combine] took two years. The Karatau Chemical Construction Trust and the Karaganda Institute for the Organization of Technical Construction in collaboration with the Kiev ZNIEP made a large contribution in this matter. The Dzhambul Oblast Party Committee gave the experimental plant constant attention.

Following the first enterprise to master the construction of housing units by the new system in Zhanatas, enterprises having a capacity of 50,000 square meters of total floor space per year are being built in Nikolayevsk on the Amur and Shadrinsk. The possibility of erecting new KPD enterprises in even shorter periods of time is envisioned in the future thanks to the use of the complete modular section system. Consolidated equipment centers and also complete building components for future "Mobil" system plants will be made at a plant construction enterprise and delivered to the site. Everyday facilities may be built from modular sections that are completely finished at the plant. The first practical step has already been taken toward this--the components for a plant in Shadrinsk have been delivered as a complete unit.

The design for the quickly assembled plant was worked out by the experimental structural design bureau in the USSR Ministry of Construction of Heavy Industry Enterprises. It was specified that complete deliveries of metal components from the All-Union Production Association in the USSR Ministry of Construction of Heavy Industry Enterprises be used to erect the production building and filler warehouses. Typical equipment in stock inventories was used for the concrete mixing center, the cement warehouse and for other auxiliary production buildings. Almost all reinforced concrete pieces, excluding exterior wall panels, will be made in cartridge-type forms that are simple to install and use and that do not require the installation of complicated foundations. Such cartridge units were designed by the Industrial Construction Design Institute.

The small list of reinforced concrete components, simplicity of technology, and low consumption of metal for equipment will ensure higher technical and economic indicators for the operation of enterprises in comparison with other similar capacities.

The design for such a plant may also be used as a basis for reconstructing large-panel housing construction enterprises with small capacities (50,000 to 70,000 square meters per year) that have up to now been turning out housing

units according to outmoded typical designs from the sixties. The transition to turning out "Mobil" system housing units will make it possible to substantially simplify the process of technologically reoutfitting such enterprises.

Calculations show that the small increase in the floor space for apartments in "Mobil" system housing units due to the use of uniform structural planning cells (3.6 x 5.4) is compensated for by means of reducing the construction time of plants and lowering labor costs and the cost of components.

Mobile construction in distant and newly developed regions will make it possible to quickly provide personnel with well-built housing. Therefore, the expertise in building such plants should be passed on as quickly as possible.

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## HOUSING CONSTRUCTION

### CANTILEVER BLOCK CONSTRUCTION SLOW TO BE INTRODUCED

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 10 Mar 84 p 2

[Article by A. Yemtsov: "Only the Signatures Are Insufficient"]

[Text] Pyatigorsk--About 10 years ago a chief specialist--a structural designer in a technical department of the regional "Caucasus Sanatorium Design" Institute--and now deputy chief engineer, K. Paniyev, worked out a fundamentally new so-called cantilever modular section and, in connection with this, a new system of constructing buildings from modular sections. A resolution by the Glavkavminkurortstroy stood out on the drawings of the innovation--"Required to be used for a given structure when the building height is more than five stories." The Main Technical Administration in the USSR Ministry of Industrial Construction held a series of conferences and drew up an overall program for scientific research and experimental design work on the cantilevered modular units. It was crowned by the construction of an experimental building that was intended to blaze a trail for the serial use of this innovation.

The enthusiasm of the ministry is understandable. This innovation contained the chief merit of modular section housing construction--the maximum industrialization of construction work. For a modular room can be completely finished under plant conditions including glueing on wallpaper and laying floors freeing, at the same time, construction workers from unappealing and labor-consuming finish processes. In addition, the cantilevered modular section provides many other advantages. First of all, the speed of the technology for erecting the buildings is doubled. Secondly, the consumption of materials is substantially reduced. Specialists in the Glavkavminkurortstroy estimated that the Paniyev modular unit would have saved a million rubles at the sanatorium hotel complex with 3,000 beds that is now being built in Kislovodsk according to the old method. The same estimates were made for the construction of a sanatorium complex for 14,000 beds that is planned to be built before 1990. The savings amounted to 22,000 tons of cement and 6,000 tons of metal--a whole stock of strictly allocated materials!

Finally, the modular unit opens up new architectural possibilities. The main deficiency of traditional modular unit housing construction is the lack of expressiveness in the buildings. The innovation makes it possible to erect original structures, to design different configurations for floors in the form of daisies, clovers, and gear wheels, and to design open terraces up high

which is especially valuable in sanatorium locations. The small space needed for the building's supports gives it an airiness and frees the surrounding site for relaxation and the free passage of people which is very important in regions with mountainous topography.

Paniyev showed designs for rest and tourist complexes that were worked out by the "Main Caucasus Ministry of Sanatorium Design." I had never before seen such expressiveness in buildings. On one sheet of drawing paper was something like a truncated pyramid turned over, on a second was a building without a common foundation that clambered scenically from the sea up a cliff on four supports.

"And this is the experimental building which was the subject of the complex program," says Paniyev, showing a model of an unusual housing unit--the area of its base is one third as large as the area of its roof.

"Where is it being built?"

"Right now, nowhere. Although the documentation is ready and money has been allocated..."

I go across the road from the Kavkazkurortproyekt to the Glavkavminkurortstroy.

"This building is not in our plan", says the chief of the main administration, V. Farafonov.

"We are ready to build it but the AUCCTU [All-Union Central Council of Trade Unions]--the client--is not coming to us with this," chief of the Main Technical Administration in the USSR Ministry of Industrial Construction, V. Ponin, clarifies the situation.

I go to the chief of the Main UKS [Capital Construction Administration] in the AUCCTU, V. Pugiyev. He, having heard me out, silently gets copies of three letters to the Ministry of Industrial Construction for the signature of the supervisors in the Central Council for the Administration of Sanatoriums with one request--to give approval of the principle of constructing an experimental building.

"The Ministry of Industrial Construction supports the innovation in words," says Viktor Georgiyevich, "but in deed have up to now not approved the very same overall program for cantilevered modular sections that was worked out and approved by the leading institutes of USSR Gosstroy.

All in all, the valuable innovation, the economical, long-range technology is buried in the minister's offices.

## HOUSING CONSTRUCTION

### STATISTICS FOR RURAL HOUSING CONSTRUCTION GIVEN

Moscow VESTNIK STATISTIKI in Russian No. 3, Mar 84 pp 78-80

[Statistics: "The Construction of Farm Houses by Kolkhozes and Sovkhozes"]

[Text] Housing construction, which is carried out by kolkhozes and sovkhozes, is an important part of the work to implement the USSR Food Program and for the social reorganization of the village. The Food Program specifies that housing units be built at a fast pace in kolkhozes and sovkhozes along with agricultural structures.

In 1982, housing units with a total floor space of 17.1 million square meters were put into use by these agricultural operations, which amounts to 16 percent of the total housing that was put into use in the country and 24 percent more than was built in 1980.

As a random survey that was conducted by the USSR TsSU [Central Statistical Administration] has shown, farm-type houses were primarily put into use by kolkhozes and sovkhozes, i.e., houses with personal plots for personal subsidiary farming. Each apartment in such houses has a separate exit to a personal plot. The survey was conducted at agricultural operations where construction of farm-type houses was done on a considerable scale. In all, 4,900 kolkhozes (19 percent of all kolkhozes) and 5,100 sovkhozes (23 percent) were surveyed. In the survey of the agricultural operations, 95 percent of the housing units built in 1982 were of the farm type; of those 97 percent were put into use at the same time as agricultural outbuildings for keeping cattle and fowl and for storing agricultural products, etc.

Some data from the survey are given below for the USSR and for union republics.

TABLE 1

Total (Usable) Floor Space in Farm Houses That Were put into Use by Kolkhozes and Sovkhozes and the Average Size of Apartments in 1982										
	Total (Usable) Floor Space Put Into Use, Thous. Sq. M	In Particular in Houses with:								
		1 Apartment		2 Apartments		3 Apartments		4 or More Apartments		
		As a Pct of the Total Put into Use	Average Size of Apartment Sq. M	As a Pct of the Total Put into Use	Average Size of Apartment thous.	As a Pct of the Total Put into Use	Average Size of Apartment Sq. M	As a Pct of the Total Put into Use	Average Size of Apartment Sq. M*	
USSR.....	4,100.3	28	70.7	62	62.7	5	37.0	5	40.5	
RSFSR.....	2,732.2	18	65.5	73	61.2	5	37.6	4	44.4	
Ukrainian SSR...	294.2	71	63.4	19	57.7	2	34.3	8	54.8	
Belorussian SSR.	129.5	57	66.0	26	65.6	6	35.5	11	41.8	
Uzbek SSR.....	141.4	16	92.1	58	70.2	15	35.4	11	30.1	
Kazakh SSR.....	445.8	30	75.1	63	72.7	5	38.3	2	46.1	
Georgian SSR....	15.1	100	179.8	--	--	--	--	--	--	
Azerbaijan SSR..	4.5	49	100.0	35	41.7	2	31.3	14	25.0	
Lithuanian SSR..	42.7	70	97.5	1	79.8	1	27.2	28	41.2	
Moldavian SSR...	10.6	50	96.3	47	68.8	--	--	3	95.0	
Latvian SSR.....	66.4	95	105.6	1	106.3	--	--	4	--	
Kirghiz SSR.....	47.8	15	76.7	79	65.4	1	40.2	5	36.5	
Tajik SSR.....	106.6	91	80.9	9	66.8	--	--	--	--	
Armenian SSR....	29.9	1	65.8	39	86.0	9	27.8	51	31.9	
Turkmen SSR.....	17.4	11	63.6	67	74.3	7	28.6	15	43.1	
Estonian SSR....	16.1	98	90.0	2	73.8	--	--	--	--	

\*Data given for houses with four apartments.

TABLE 2

Farm Houses Put into Use by Kolkhozes and Sovkhozes According to the Method by Which the Work was Done					
	Number of Houses Put into Use	In Particular Built by the:			
		Contract Method		Executive Method	
		Number of Houses	As a Pct of the Total Number of Houses	Number of Houses	As a Pct of the Total Number of Houses
USSR.....	39,531	10,294	26	29,237	74
RSFSR.....	25,594	5,757	22	19,837	78
Ukrainian SSR...	3,925	491	13	3,434	87
Belorussian SSR.	1,506	312	21	1,194	79
Uzbek SSR.....	1,155	831	72	324	28
Kazakh SSR.....	3,958	410	10	3,548	90
Georgian SSR....	84	84	100	--	--
Azerbaijan SSR..	48	46	96	2	4
Lithuanian SSR..	372	221	59	151	41
Moldavian SSR...	92	9	10	83	90
Latvian SSR.....	601	524	87	77	13
Kirghiz SSR.....	399	241	60	158	40
Tajik SSR.....	1,272	1,021	80	251	20
Armenian SSR....	209	209	100	--	--
Turkmen SSR.....	139	113	81	26	19
Estonian SSR....	177	25	14	152	86

TABLE 3

Distribution of Farm Houses Built by Kolkhozes and Sovkhozes According to the Type of Materials Used for the Walls										
			In Particular:							
			1 Apartment		2 Apartment		3 Apartment		4 Apartment	
	Stone	Wood	Stone	Wood	Stone	Wood	Stone	Wood	Stone	Wood
USSR.....	58	28	54	30	57	29	61	23	88	6
RSFSR.....	52	37	37	48	54	36	55	31	88	8
Ukrainian SSR...	94	2	95	2	91	2	98	2	95	--
Belorussian SSR.	67	25	54	37	85	11	72	19	86	2
Uzbek SSR.....	87	0.4	74	2	90	--	89	--	93	--
Kazakh SSR.....	43	8	29	10	49	7	51	3	76	--
Georgian SSR....	100	--	100	--	--	--	--	--	--	--
Azerbaijan SSR..	98	2	98	2	96	4	100	--	100	--
Lithuanian SSR..	37	48	27	55	100	--	--	100	61	33
Moldavian SSR...	100	--	100	--	100	--	--	--	100	--
Latvian SSR.....	15	85	11	89	100	--	--	--	100	--
Kirghiz SSR.....	85	5	76	11	87	4	100	--	76	--
Tajik SSR.....	95	1	95	1	93	1	--	--	--	--
Armenian SSR....	100	--	100	--	100	--	100	--	100	--
Turkmen SSR.....	70	9	63	27	67	8	84	16	83	--
Estonian SSR....	84	13	86	12	--	100	--	--	--	--

\*The total (usable) floor space in farm houses (stone, wood and other building materials) was taken as 100 percent.

TABLE 4

Farm Houses Put into Use by Kolkhozes and Sovkhozes According to the Method by Which the Work was Done			
	Average Cost of Construction of 1 Sq. Meter, Rubles		
	All Houses	Stone	Wood
USSR.....	236	238	230
RSFSR.....	251	263	228
Ukrainian SSR.....	194	195	141
Belorussian SSR.....	200	204	189
Uzbek SSR.....	189	191	336
Kazakh SSR.....	212	217	195
Georgian SSR.....	166	166	--
Azerbaijan SSR.....	166	169	60
Lithuanian SSR.....	321	340	331
Moldavian SSR.....	183	183	--
Latvian SSR.....	275	200	289
Kirghiz SSR.....	192	187	128
Tajik SSR.....	191	189	115
Armenian SSR.....	171	171	--
Turkmen SSR.....	193	193	154
Estonian SSR.....	269	276	247

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## CONSTRUCTION METHODS AND MATERIALS

### MINISTER OF CONSTRUCTION, ROAD MACHINERY ON INDUSTRY TRENDS

Moscow EKONOMICHESKAYA GAZETA in Russian No 20, May 84 p 8

[Article by V.I. Chudin, USSR minister of construction, road and municipal machine building: "For Construction Projects--Modern Equipment"; passages enclosed in slantlines printed in boldface]

[Text] The principal directives of the 26th party congress and subsequent plenums of the CPSU Central Committee in the field of intensification of production defined the significant qualitative changes in the production, technical and economic activities of our enterprises and of the sector as a whole. From the beginning of the 11th Five-Year Plan, construction, road and municipal machine building provide for the entire growth of production output solely through increased labor productivity and with the same material labor resources. This tendency has acquired a stable character and, judging by the results of the past four months, the intensification process is being deepened still further.

Compared to the same period of last year, the volume of production for the Ministry of Construction, Road and Municipal Machine Building grew 3 percent in the first quarter and labor productivity--6 percent. The preliminary results of April show that the work is proceeding at the prescribed high rate.

Our machine builders are successfully fulfilling socialist commitments for an above-plan growth of labor productivity of 1 percent and a 0.5-percent reduction in production cost. The task set by the party is being systematically carried out in regard to developing high-production machinery for comprehensive mechanization of basic operations at all stages of construction production.

/Deepening of the process of production intensification, acceleration of the rate of scientific-technical progress within the sector are connected to the introduction of the programmed goal method of planning./

Three sectorial special-goal complex program possess a special significance: "Raising the Technical Level of Production Output," "Reequipment" and "Economy." They organically include the targets of state scientific-technical programs. Refinements are submitted each year simultaneously with the approval of the national-economic plan.

Such a concentrated subordination of all the means and resources of the sector to a single directive guidance produced a tremendous disciplined impact on our workers--from rank-and-file machine-tool operators to major operational managers.

How is the implementation of the sectorial special-goal complex programs to be characterized and what problems arise in the course of their introduction?

It was found necessary to change the structure of design and technological organizations. This was dictated by considerations of their deep specialization and the need of clearing thematic plans of nonrelated assignments. Expansion of subunits and strengthening of their personnel composition have led to a return of those specialists to the number of creative workers who, because of splintering of departments, sectors and laboratories, were diverted to administrative leadership. With specialization, a real possibility appeared of lending to institutes greater power and reorienting them to promising directions of general sectorial and national-economic importance.

Setting up has been justified of a system of production associations that came to include design and technological centers which are responsible for development to series production of the whole relevant cycle of equipment produced by one or another association.

The effectiveness of the conducted reorganization was positively confirmed by the practical experience of five production associations directly (while bypassing the all-union production association) under the ministry. They are Krasnyy Eksvator (Kiev), Volgotsemmash (Togliatti), Avtokran (Ivanovo), Soyuzkonditsioner (Kharkov) and Stromavtoliniya (Mogilev). It ought to be emphasized that structural improvement applied not only to successful and strong enterprises but also to those that were operating in an unstable and unsatisfactory manner. The chief unifying factor was the technological and product common factor of the items put out. Quite understandable apprehensions arose in regard to the effectiveness of management on the part of the head enterprise because of the considerable geographical remoteness of the plants making up the new production association. One should critically evaluate all the operational results of the new associations not only according to production and economic indicators but also within the context of present requirements of technical progress and to elucidate the character of functional interrelationships within the association and with ministerial organs.

Comparison shows that since the beginning of the five-year plan the new production associations reached better results than the average for the sector for all qualitative indicators and renewal and technical level of production.

Such a policy of raising production efficiency while simultaneously curtailing the administrative apparatus will be maintained in the future. This task is of foremost importance in the light of the instructions contained in K.U. Chernenko's speech at the April Plenum of the CPSU Central Committee.

/Data of the USSR Central Statistical Administration confirm the positive changes in the structure of the new equipment put out by the sector./

Whereas during the 10th Five-Year Plan, 483 varieties of new equipment were developed, 455 items were series produced and 436 were removed from production, the sectorial program for the current five-year plan provides for the development and modernization of 1,008 items, introduction into production of 592 items and removal from production of 389 items of old equipment. Work progress provides grounds for believing that the five-year targets of the new-equipment program will be fulfilled.

Justifiable reproaches of users of the equipment oblige us to be more strict with respect to planning quality of the sector's work. Its basic deficiency is in our view the fact that in examining the developmental prospects of the Ministry of Construction, Road and Municipal Machine Building planning organs base themselves on the requirements solely of capital construction and municipal services. At the same time, the sector is obliged to provide equipment for the mining complex, agriculture, forestry, land reclamation and the fuel industry. As a result a gap is rising between the requirements of consumer sectors and our capabilities.

If on the average in machine building one toolmaker provides for 5-7 machine-tool operators, the system of plants of construction, road and municipal machine building in which about 300,000 workers are employed is responsible for the reequipment and supply of 12-13 million persons. I would like to draw the attention of Gosplan USSR and Gosstroy USSR to the fact that the once approved position providing for significant outlays for the creation of a production base in the case of erection of any facility that is under construction in no way considers that it must have for its basis the production and centralized servicing of machines directly participating in construction.

Is not the cause to be found in this for the fact that there has been occurring for an extended period of time not a strengthening of the machine-building base but rather a dissipation of resources among a great number of repair machine shops which in the great majority, as shown by the survey data of the Central Statistical Administration, are being utilized extremely poorly and even in principle cannot effectively and quickly solve the problem of reequipment. We are thus making reference not to some unknown sources for development of plants and organization of construction, road and municipal machine building but rather to the fact that the direction of their use should be changed for the solution of the main problem--significant strengthening of the technical and production potential of the basic producer--specialized machine building.

Despite the high level of mechanization of operations, the structure of operated equipment displays a predominance of machines with average figures and a manifest shortage of big machines as well as miniequipment for the performance of minor, yet labor-intensive, operations.

There can be seen in this a serious defect of the sector, which for a long time has not aimed at the use of "adapted" components produced by related producers, including internal combustion engines. It is namely for this reason

Reduction of Outlays per Ruble  
of Commodity Production for Ministry  
of Construction, Road and Municipal  
Machine Building  
(1980 = 100 percent)

1981	100.13
1982	99.36
1983	97.77
1984 (plan)	96.37

Level of Mechanization  
(in percent)

at earth-moving operations	--99.4
in mining and processing of nonmetallic materials	--99.1
at installation-construction structures	--96.2
at concrete and reinforced concrete operations	--93.2

that a number of design solutions are being worked out at the present time in an accelerated manner and specific plants are determined which must solve in the immediate future the problem of production of mobile equipment for construction and municipal purposes.

A practice which has developed for a number of reasons of mounting of work equipment on tractor or motor-vehicle bodies of agricultural and particularly transport type has become intolerable and basically contradicts the requirements of technical improvement. Under present-day conditions, the development of new generations of equipment should be considered in terms of the main objective--to produce a unit functionally intended for a specific form of a complex of operations: to loosen, to level and to move large volumes of earth.

Today we produce each year tens of thousands of wheel-and-caterpillar machines. The need is increasingly developing for transferring a number of plants engaged in the production of industrial tractors to the Ministry of Construction, Road and Municipal Machine Building. It would be useful to set up the production of diesels which in design are in keeping with the character of the work done. These conclusions are unambiguously confirmed by world experience in the manufacturing of earth-moving equipment. The same applies to hydraulic drive.

/What are we doing and plan to do for the purpose of eliminating existing bottlenecks and disproportions?/

It is important to improve the direction of capital investment in the development of capacities. The main thing now is not new plants but rather first

priority modernization work on and reequipment of existing enterprises. It is important to strengthen the design and technological base and the experimental base.

In commodity production, the share is expanding of the share of leveling of working equipment is expanding with simultaneous growth of unit capacities of machines. It will be necessary to set up the production of mobile miniequipment for the purpose of sharply increasing labor productivity at different operations with small size.

In the field of mechanization of manual labor, developments are going on and the output of construction robot equipment is increasing for finishing, installation, /profileplanirovochnyye/, materials-handling and forestry operations.

An energy saving hydraulic drive is to be incorporated in the design of excavators, cranes of all types, elevators and large loaders. The specific materials intensiveness of this equipment is being reduced.

For the purpose of reducing the cycle of change of equipment generations, we are continuing to bring closer design and technological organizations to manufacturing enterprises by including them in specialized-type associations. All these and other directions are reflected in sectorial programs as well as in all-embracing organizational document--"Improvement of Sectorial Management and Specialization," going up to 1990--to be completed in 1984.

Other forms and methods of solving pressing problems are possible. But we proceed from the need of advancing growth of the machine-building complex for providing equipment for very labor-intensive sectors. These directions constitute the basis of the five-year plan, the foundation for which is being laid now.

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## CONSTRUCTION METHODS AND MATERIALS

### PROGRAM FOR INTRODUCTION OF NEW TECHNOLOGY, MATERIALS OUTLINED

Moscow BYULLETEN' STROITEL'NOY TEKHNIKI in Russian No 4, Apr 84 pp 6-7

[Article by Yu. I. Yakovenko, chief, Main Design and Scientific-Research Work Section, Glavpromstroyproyekt [Construction and Planning of Industrial Enterprises Main Administration]: "On the Technical Level of Project Planning Decisions in Glavpromstroyproyekt Organizations"]

[Text] An important role in increasing the effectiveness of capital construction and accelerating scientific-technical progress belongs to project designers, who are at the source of construction and determine its technical level. Under conditions of strict economy, it is necessary to have effective measures for improving the quality of developments and the application of the most rational decisions based on the achievements in science, technology and leading domestic and foreign experience.

In organizing the work of its subordinate project planning associations and institutes, the USSR Gosstroy [State Committee for Construction Affairs] Glavpromstroyproyekt has for a number of years issued order No 1 at the beginning of each year, dealing with the Technical Measures for Main Administration Organizations for the Coming Year. In 1984, based on the decisions of the 26th CPSU Congress and the November (1982), June and December (1983) Plenums of the CPSU Central Committee, Glavpromstroyproyekt not only established general tasks for the associations and institutes on the economy of basic construction materials, the reduction of labor expenditures in construction and the reduction of estimated cost, but also set specific tasks for the introduction of progressive designs, materials and methods of construction production, progressive technical decisions, sanitary-technical systems to ensure the economy of fuel-energy resources, electrical and thermal energy and other tasks -- all through project design.

This same order suggested that the managers of project planning and scientific research institutes and all their subdivisions develop organizational and mass political work in conjunction with the social organizations on mobilizing the collectives toward the fulfillment and overfulfillment of the plan assignments for 1984. This would include an increase in labor productivity by 1 percent over the plan and a reduction in production cost by 0.5 percent. Also, measures should be taken for expanding socialist competition for the further development of collective initiative at the Gidroyekht Institute imeni S. Ya. Zhuk.

The tasks for the introduction of progressive designs, materials and methods of construction include practically all the indicators on industrial construction, which are reflected in the section entitled "Construction" in the tasks of the State Plan for Economic and Social Development of the USSR on science and technology. Some of the tasks set for the glavk institutes exceed the level of assignments provided in the national economic plan in terms of volumes of introduction of new structures, materials and products. For example:

the volume of application of increased strength and high-strength steels in the blueprints of steel structures developed in 1983 reached 510,000 tons, which comprises almost 50 percent of the State Plan for 1984. The tasks for the application of increased strength and high-strength steels remains at the same level in planning for 1984;

the development of steel structures with consideration for conveyer assembly and large unit installation of coverings in industrial buildings was established in 1984 in the volume of 500,000 square meters, which is over 95 percent of the plan for 1984;

the application of wide-ledge I-beams in steel building structures has been envisioned in the volume of 240,000 tons, which comprises almost 60 percent of the State Plan;

the application of sheet metal from carbon and low-alloy steel differentiated by strength properties, including by durability group II, will comprise 230,000 and 40,000 tons, or 45 and 40 percent of the State Plan.

The technical measures for organizations of Glavpromstroyproyekt for 1984 provide for tasks on the introduction of other progressive structures and materials including:

fully plant prefabricated reinforced concrete building covering slabs in a volume of 670,000 square meters;

prefabricated prestressed reinforced concrete structures — 320,000 cubic meters;

load bearing and enclosure structures and products made of lightweight concrete-- 350,000 cubic meters;

reinforced concrete structures made of grade 500 concrete or higher -- 30,000 cubic meters;

effective sheet metal profiles in steel building structures — 120,000 tons;

lightweight metallic building structures delivered in complement — 800,000 square meters;

shaped steel sheeting in coverings and walls of industrial buildings -- 17,000 tons;

steel structures with bolt connections -- 260,000 tons;

triple-layer enclosure structures and monopanel made of steel and aluminum sheeted sheets with effective insulator -- 150,000 square meters;

structures and products made of aluminum alloys -- 780 tons;

industrial partitions -- 550,000 square meters.

By means of the application of improved normative documents, effective types of steels and economic sheet profiles, as well as the introduction of optimal design decisions, the task provides for achieving a savings of sheet metal in the design of facilities under capital construction in 1984 by 9.7 percent as compared with the 1980 level, and by 11.1 percent throughout the Soyuzmetalstroyproject [All-Union Scientific Research Institute on Construction and Design of Metallic Structures] associations as a whole. This will yield an actual savings of 130,000-135,000 tons of sheet metal. A savings of 2.4 percent on cement in planning facilities for 1984 is envisioned as compared with the 1980 level. With consideration for the assignments, the Glavpromstroyproject associations and institutes on the whole in planning for 1984 should reduce the estimated cost of construction by 137-138 million rubles, labor consumption in construction -- by 3.43-3.45 million man-days, the savings of heat will comprise 270,000 Gcal, and the savings of electrical energy -- 2.29 million kW-hrs.

Attributing particular importance to a radical increase in the level of industrialization in capital construction which would ensure the acceleration of operational introduction of production capacities and facilities and an increase in the productivity and reduction in the numbers of workers engaged at the construction sites, the Glavpromstroyproject, in its assignments to subordinate institutes for 1984, has expanded the nomenclature of effective reinforced concrete and metallic structures and progressive decisions and has established the specific volumes of their application. In addition to the assignments for 1983 regarding the design introduction of "span width" covering slabs, rectangular section columns without joints for multi-story buildings, triple-layer wall panels with effective insulators and flexible connections, honeycomb covering slabs with reduced expenditure of reinforcement steel, progressive types of pilings, trusses made of wide-ledge I-beams and curve-welded profiles, and plastic and reinforced concrete pressure pipes, the following specific assignments were additionally set for the institutes in 1984 on the application of:

reinforced concrete structures manufactured according to the casing-free (sand) technology;

steel window sashes with double glass panes for industrial buildings;

administrative-domestic buildings at industrial enterprises with panel type construction;

oversized wall panels of increased plant readiness with glass inserts.

Aside from this, it has been suggested that the institutes make broader use of building modules delivered in complement for housing basic and auxiliary production; of wood laminate structures for production, agricultural and warehouse buildings and extruded asbestos cement structures. They should also expand (upon agreement with the construction organizations) the sphere of application of monolith concrete in underground structures using the integrated-mechanized methods of erecting structures and progressive types of stock casings.

Glavpromstroyproyekt Order No 1 to Managers of Integrated Planning and Scientific-Research Institutes indicates the necessity of radically improving all work on accelerating scientific-technical progress in construction for 1984, on seeking progressive methods of comprehensive utilization of raw goods and materials, and of protecting the environment. It proposes the implementation of specific measures for increasing the effectiveness of scientific-research work and accelerating the introduction of scientific achievements into the practice of design and construction in light of the requirements stemming from the resolution of the CPSU Central Committee and the USSR Council of Ministers, "On Measures for Accelerating Scientific-Technical Progress in the National Economy."

Particularly thorough attention in the preparation of the order at Glavpromstroyproyekt was given to the most important finished scientific-research developments of the USSR Gosstroy institutes which had been fulfilled in the past 3 years according to the integrated scientific-technical program, the programs for solving vital scientific-technical problems and sectorial scientific-technical programs on construction, as well as the plans for work of scientific-research organization. The application of the latest scientific developments in specific projects is aimed at accelerating the mastery of new building structures, building materials, the technological processes for their manufacture, and the production of construction-installation work. Some experience was accumulated in 1983 by the glavk organizations on these matters.

The application of plans developed by designers in the scientific section of the Urals Promstroyniiprojekt [Scientific Research Institute on Industrial Design and Construction] yielded an economic effect in the sum of 250,000 rubles, reduced the expenditure of metal and cement, and reduced the construction time of the facilities. These plans were used in the blueprints of one of the compressor stations of the Urengoy-Pomara-Uzhgorod pipeline and the foil shop of the Uralelektromed' Combine in the city of V. Pyshma, and dealt with design decisions for the "zero cycle" of industrial buildings in the form of a geotechnical mass. The designers at the Kharkov Promstroyniiprojekt were guided by scientific recommendations in developing blueprints of structures for vibroinsulation of equipment undergoing modernization at two enterprises of Minchermet [Ministry of Ferrous Metallurgy]. This reduced the level of noise and vibration to a level below that allowed by health standards. Also, not only did it significantly improve labor conditions, but because of the reduction in time for equipment modernization the economic effect comprised 200,000 rubles.

Based on an examination of the results of scientific developments by the Donets Promstroyniiprojekt and the organization for industrial production of formed polyethylene sheets, the use of 200 tons of formed polyethylene sheeting to protect reinforced structures against the effect of aggressive media is envisioned in the project plans for 1984.

The specialized associations Soyuzvodokanalprojekt [All-Union State Order of the Labor Red Banner Planning Institute on the Survey and Design of External Water Lines, Sewers and Hydrotechnical Structures], SanteKhprojekt [Sanitary-Technical Facilities Design Institute] and the institutes of Promtransniiprojekt [All-Union Scientific-Research and Design Institute on Industrial Transport] and PNIIIS [Scientific-Research and Planning Institute on Construction] were given assignments for 1984 for introducing progressive planning decisions and structures appropriate for these organizations through their project planning. These included recycling of purified drainage waters in the system of industrial water supply and irrigation, purification of drainage waters on filters with polyurethane filler, heat treatment and burning of sediment in drainage waters, air-to-air heat exchangers, heating units of type AO-2 and AOD-2, heating systems with outside regulation, electrification of railroads in industrial transport, application of an automated complex for measuring temperature of permafrost soils, use of integrated methods for studying the properties of backfill soils under northern conditions, and other tasks.

An important factor in improving the quality of projects and the labor productivity of the project planners is mechanization and automation of planning work. In accordance with the tasks determined by the Comprehensive Program for Automation of Project Planning Work at USSR Gosstroy Organizations for 1981-1985, the Glavpromstroyprojekt order to associations and institutes establishes specific assignments for the level of automation of project planning work to the end of 1984. Depending on the level of equipment of the institutes, this indicator is set between 11 and 21.5 percent. This same order specified the times for delivery and operational introduction of four series ES electronic computers at the main administration organizations in 1984.

Organizational-technical measures for the fulfillment of the established tasks have been developed and ratified by the Glavpromstroyprojekt institutes, and socialist competition on their fulfillment and overfulfillment is underway.

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## CONSTRUCTION METHODS AND MATERIALS

### NEW BUILDING MATERIALS DEVELOPED IN UZBEKISTAN, KHARKOV, ALMA-ATA

Alma-Ata NARODNOYE KHOZYAYSTVO KAZAKHSTANA in Russian No 1, Jan 84, pp 65-66

[Article: "What's New in Construction"]

[Text] Precast Reinforced Concrete Solar Yard

Specialists of the USSR Gosstroy NIIZhB [Scientific Research Institute of Concrete and Reinforced Concrete], the USSR Minmontazhspestroy [Ministry of Installation and Special Construction] VNIITEPLOPROYEKY [All-Union Scientific Research Institution of Thermal Design] and the Uzbek SSR Minsel'stroy [Ministry of Rural Construction] have again developed a new method for speeding up concrete curing by using solar energy. This method is important in Kazakhstan where there are many sunny days and where more than one-third of pre-cast reinforced concrete is used in casting yard conditions.

Thermal processing of products is done in metallic forms equipped with "SVITAP", a special solar-sensitive and heat-retaining cover. The cover is a metallic framework made of No 6.5 channel with two layers of type V polyvinyl chloride membrane, type S polyethylene or roll fiberglass produced by the North Donets Industrial Combine, Stekloplastik.

These materials allow solar radiation to pass through and under the "SVITAP" cover the temperature on the concrete surface of the product reaches 70° - 90° during solar heating. The weight of a 6,200 x 1,700 cover is 200 kilograms.

Speeding up concrete curing is done in this way. The framework with the membrane is placed on a metallic form along with the freshly formed product and is clamped into place. The distance between membrane layers and also between the lower membrane and the product is 15-25 mm. A reinforced net made of polyethylene thread is stretched to set these spacings under the membranes. On the pallet side of the form they construct thermal insulation of or foam plastic.

The high temperatures and 100 percent humidity create conditions favorable for accelerated concrete curing.

The layer of air between the membrane and concrete lowers the heat loss during periods of reduced solar radiation and preserves the accumulated temperature on the product surface during the day. The second layer of polymer membrane forms an aerial layer which hinders product cooling at night.

Favorable conditions for internal heat evolution are also created during solar heating of concrete in a form with "SVITAP" covering. Cement hydration heat is an energy potential which is practically not used during normal product curing.

On a sunny day this method speeds up form circulation. In this way the required product removal strength is reached. For more complete use of solar heat, it is best to complete frame molding by 10 - 11 am.

The developed technology of curing concrete was successfully put into casting yard conditions at the Nariman ZhBI [Reinforced concrete products] Factory in Tashkent Oblast. It is possible to set up a solar yard in other places by using an existing metal-form yard.

In the method presented, quality and product reliability are increased by totally eliminating shrinkage cracks and to save 65-70 kilograms of conventional fuel per cubic meter of reinforced concrete, the water flow is lowered to the technological requirements. Moreover, metal form reliability is guaranteed because they are not subject to corrosion in the steamy environment and the expense of building boiler steam- and condensers is eliminated.

For detailed information write USSR Gosstroy NIIZhB, No 6 Second Institute Street, Moscow 109389.

#### Thiokol Compound Joint Sealant

In the construction of the Alma-Ata industrial structure of the biopiant, Thiokol compound AM-05, which has high sealability, is being used to seal the joints of exterior building panels to steel window frames and the joints of the frames to the glass. The compound is prepared right at the construction site by mechanically mixing T-1 and T-17 components in a 10:4 ratio until it reaches a ductile, pasty, homogeneous mass.

Before the compound is applied, joint recesses are cleaned and primed to provide reliable adherence to the concrete surface. The primer is AM-05 compound and BR-1 solvent in a 1:10 ratio (GOST [All-Union State Standard] 443-76).

Sealing the joints of wall panel and metal frames is done with putty and packing and seals of the metallic frame element and glazing groove joints is done with a pneumatic injection gun.

The design of the pneumatic injection gun and the putty nozzle were developed by innovators from the Almaatapromstroy [Alma-Ata Industrial Construction] Trust. Their use promotes improved working conditions.

The average AM-05 compound per meter of joint is 0.1 kilograms and a worker can seal 180-200 meters of joint per shift.

For details write Alma-Ata Promstroy Combine, 2 Zlatoustovskaya Street, Alma-Ata 480114.

#### Pyramidal Foundations Standardized

The Kharkov Promstroy NIiprojekt [Industrial Construction Scientific Research Design Institute] together with the Ukrorgtekhstroy [Ukrainian Organization of Technical Construction] have standardized monolithic reinforced concrete graded foundations in the 1.412 series into a natural foundation for construction of single- and multi-story framework industrial buildings. As a result, the number of gages is reduced from 44 to 11 and intervals from 95 to 29. Instead of a graduated form for footings, a truncated pyramid is suggested. This allows a 7-15 percent reduction in concrete and simplifies construction of the metallic forms, especially for two- and three-level foundations.

For stepped foundations with identical footing dimensions and with different heights of the graded parts, one pyramid concrete form is erected. The pyramidal step height relationship to the depth is the same as for the graded foundation. The height of the pyramidal part in the places of the height changes in the corresponding series 1.412 series foundations step changes is equal to them or greater in all cases. Therefore, footing reinforcement is the same as in the 1.412 series. The size of the column footing and sleeves, reinforcement and concrete quality also conform to this series.

To preserve the unified size of column footings in panel walls, support on the foundation is achieved through the use of bearing base panels without foundation joists or with foundation joists at projections. In individual cases when bearing panels rest at a foundation height of 1.5-3 meters, small concrete posts are necessary. At great height brackets are required which are emplaced by inserting components after concreting the column footings. In this way the unified dimensions of column footings specified by the 1.412 series are maintained.

The Kharkov Promstroy NIiprojekt has developed "The Construction of Unified Monolithic Reinforced Concrete Foundations for Industrial Buildings" plans and the Ukrorgtekhstroy has developed plans for reuseable metallic hinge-assembly casings made up of two elements: column footing casings and pyramidal casings with folded lobes for the lower foundation part.

The foundation has been widely used in projects built by the Kharkovpromstroy, Zhitomipromstroy and Kremenchugpromstroy combines.

For additional information write PromstroyNIiprojekt, 8 Dzerzhinskiy Square, Kharkov 310022.

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## CONSTRUCTION METHODS AND MATERIALS

### SHORTAGE OF ROOFING MATERIALS SLOWS CONSTRUCTION IN TUSSR

Ashkhabad TURKMENSKAYA ISKRA in Russian 31 Mar 84 p 2

[Article by G. Komarovskiy, deputy chief of TuSSR Minstroy [Ministry of Construction] Turkmenstroykomplekt Administration, and TURKMENSKAYA ISKRA correspondent N. Sosnina: "Attention Required: A House Without a Roof"]

[Text] "All's well that ends well," goes the old popular saying. In fully subscribing to it, however, builders might modify it somewhat: "The crown completes the home." This is because without the crown, the roof, it is impossible to place a building in operation. Meanwhile, it was in arranging roofs at many major structures that collectives of TuSSR Minstroy encountered serious difficulties.

The matter arose at sites of the Bezmein Rug Combine and the Ashkhabad Turkmenkabel', Ashneftemash, Krasnyy Molot and Large-Panel Housing Construction plants because of the absence or shortage of heat-insulating, increased-rigidity slag-cotton shingles. The acuteness of the problem was determined by the fact that first of all it arose recently and secondly it is very difficult today to resolve it locally in the republic.

Enterprises of the TuSSR construction materials industry do not manufacture the rigid heat-insulating slag-cotton shingles on a fireproof basis which are recommended by planning institutes. After numerous talks Minstroy succeeded in protecting 5,190 m<sup>3</sup> of housing and acquiring eight carloads of shingles from the Kastopolskiy Plant of Sumy Oblast. The materials were sent primarily to the Bezmein Rug Combine. The Turkmenstroykomplekt Administration is trying to satisfy the needs of other national economic construction sites this year, but what is to be done next year? The party is setting the task for more effective use of local assets. There is a possibility for arranging the republic's own very necessary production. The TuSSR Minpromstroymaterialov [Ministry of Construction Materials Industry] has a slag-cotton shop in its own Bezmein Combine imeni 50th Anniversary of TuSSR. At the request of the TuSSR Minstroy the collective made a test lot of type 175 rigid shingles fully suitable for roof insulation. The builders gave the go-ahead and enterprise director I. Turgunbayev is ready to continue putting out the material so very necessary to contractors, but... Here is where the various "buts" begin.

The TuSSR Ministry of the Construction Materials Industry did not plan a single cubic meter of rigid shingles for its combine for 1984. Minister V. I. Gladkiy makes reference to the fact that he was not given such a quota either by the TuSSR Gosplan or Gossnab. Since he has no supply authorizations, consequently there is nothing to talk about.

G. F. Davydov, an administration chief of TuSSR Gosplan, explained that the initiative for changing the plan's product list and introducing new kinds of products to it must stem from below, i.e., from the ministry. But Gladkiy did not go to Gosplan with such a proposal. R. Meredov, first deputy chairman of TuSSR Gossnab, promised to send an appropriate letter to the ministry in the near future. As a matter of fact, he sent it, but still has not received a response.

It would appear that in this case many organizations privy to the problem removed themselves from its resolution. The fact is that the letter to Minpromstroyaterialov should have been sent earlier and more persistence shown in assuring its effectiveness, and not only by Gossnab, but also by TuSSR Gosplan. It is the committees' general concern to perfect management style, improve deliveries and eliminate cross hauls.

And TuSSR Gosstroy, which is called upon to dictate technical policy in capital work, should have declaimed more loudly and in places used its authority to replace the production of obsolete, uneconomical articles with more progressive ones. The fact is that there was a clear blunder with the slag-cotton shingles.

For long years the Bezmein Construction Materials Combine has put out weak, soft shingles not in great demand in Turkmenistan. For this reason the combine is forced to send them outside the republic. Trainloads of the soft shingles go to Kazakhstan, Uzbekistan and Kirghizia and carloads of rigid shingles hasten in the other direction to Turkmenistan from the Ukraine and that same Uzbekistan.

You will agree that all this ties in poorly with party demands to improve the level of national economic management. The railroad is burdened, a shortage of transportation is created artificially and money is spent for nothing.

But most important, the growing demand for effective shingles in the republic is not being satisfied. According to TuSSR Gosstroy data, by 1985 there will be a need for 1,208,000 m<sup>2</sup> of roofing with these shingles. It follows that the task of developing a new production has been posed precisely.

And so the Bezmein Construction Materials Combine imeni 50th Anniversary of TuSSR must produce the shingles needed by the builders through reconstruction, a partial replacement of equipment and an improvement in the supply of raw material--resin. But no fervent interest in this is seen in the ministry. PTO [production-technical department] chief V. K. Vorob'yev expressed himself rather frankly:

"Our primary job is the plan; no one pays us for an experiment. Even the smooth-running Kastopolskiy Combine does not always succeed in obtaining shingles of the necessary thickness."

Well, certain costs are inevitable at first. Funds and more rigid industrial discipline will be necessary. But the period of reconstruction can be reduced considerably if there is good management, enterprise, competent control over the adoption of new things, and close cooperation with scientists of the Vilnius VNII [All-Union Scientific Research Institute] of Heat Insulation; and then justify the expenditures.

We are all obligated to be able to see the perspective and work for the end result, but the question of where to get rigid insulating shingles not only tomorrow, but today, is urgent and must be resolved quickly. The construction sites are waiting.

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## CONSTRUCTION METHODS AND MATERIALS

### SHORTAGE OF LIGHTWEIGHT CONCRETE AGGREGATES IN GESSR

Moscow STROITEL'NAYA GAZETA in Russian 25 Mar 84 p 3

[Article by T. Kavtaradze, candidate of technical sciences, Tbilisi: "High Rates for Technical Progress: Handicraftsmen Against Their Will"]

[Text] Reducing the overall weight of buildings is one of the most urgent problems in construction. According to Gruzniistrom [Georgian Scientific Research Institute of Construction Materials] estimates, the adoption of lightweight concrete for constructing a nine-story building reduces the structure's overall weight by 41 percent. The cumulative economic impact from a reduction in the consumption of materials and transportation expenses exceeds 25,000 rubles. Lightweight concrete also is no less effective in industrial construction.

Gruzniistrom came up with a manufacturing method for articles. The standardized strength characteristics of the articles were determined on the basis of local porous aggregates and necessary experimental studies also were performed. There already is a program for calculating multicavity panels for civilian housing construction on an EVM [electronic computer], their shop drawings already exist, and the appropriate catalogue has been approved.

Specialists from TbilZNIIEP [Tbilisi Zonal Scientific Research Institute of Experimental Planning] developed lightweight concrete floor slabs for series "IIS-04" houses and drew up recommendations for full-scale use of lightweight concrete for construction in seismic areas. Nine-story lightweight concrete houses were planned on the basis of these proposals.

It would appear that the documentation and plans have been prepared for the broad adoption of lightweight concrete in the republic, and that matters should move forward, but in practice everything is somewhat different.

Use of the effective material in experimental construction was examined twice but in both cases nothing came of it. For example, a nine-story series "IIS-04" residence with standardized frame was erected, but it was made of heavy concrete.

The reason lies in the acute shortage of lightweight aggregates delivered from Armenia. At one time they were sufficient, since lightweight structures were produced in limited amounts, but now the situation has changed: 700,000 m<sup>3</sup> of aggregates only partially cover the needs. Moreover, the cost of their long-distance transportation is high.

The present requirement for lightweight aggregates is around two million cubic meters per year. Where are they to be obtained? It is no secret: from the large deposits of tuffs and scorias existing in the Akhalkalakskiy and Bogdanovskiy rayons. According to Gruzgeologiya [GeSSR Administration of Geology] data, the confirmed reserves of lightweight aggregates comprise over 215 million cubic meters in the republic, but the problem is that these reserves are practically not being developed.

Previously the industrial development of major deposits located in South Georgia was held up due to the absence of a railroad there. But now construction of the Marabda-Akhalkalaki rail line is in full swing. The USSR Minstroyaterialov [Ministry of Construction Materials], however, continues to take a passive position. It was during 1976-1977 that it was to have completed construction of a quarry in Akhalkalakskiy Rayon with a capacity of one million cubic meters of lightweight aggregates per year. Subsequently it was planned to increase the capacity to two million cubic meters. Unfortunately the quarry's construction is postponed each year.

The GeSSR general comprehensive plan for development and location of a material-technical base up to 1990 envisages a sharp increase in volume of production of components made of lightweight aggregates. By the end of the present five-year plan it is planned to bring their proportion to 35-40 percent.

Program implementation naturally demands an acceleration of work to develop new deposits. Inasmuch as the Minstroyaterialov is delaying unjustifiably, the consumers are forced to develop deposits with their own resources. For example, the republic's ministry of construction has opened its own quarries.

At the present time other republic departments are also seeking funds for development projects. For example, Gruzmezhkolkhozstroy [Georgian Interkolkhoz Construction Organization] expressed the desire to set up its own enterprise in Akhalkalakskiy Rayon with a capacity of 200,000 m<sup>3</sup> of aggregates per year. The Zaktransstroy Trust, Tsentrosoyuz [Central Union of Consumers' Cooperatives] and others also have expressed a wish to take part in building new quarries.

It is known, however, that the development of small, semihandicraft enterprises is unprofitable and contributes to a dissipation of material-technical resources. This is why the Ministry of the Construction Materials Industry, which is capable of setting up large-capacity complexes for the production of lightweight aggregates, has to have the main say.

## CONSTRUCTION METHODS AND MATERIALS

### EXPERIMENTAL METHOD OF BUILDING ON PERMAFROST DISCUSSED

Moscow STROITEL'NAYA GAZETA in Russian 15 Feb 84 p 3

[Article by V. Poleshchuk, director, Yakutsk affiliate of Zabaykalpromstroy-niiproekti [Transbaykal Industrial Construction Scientific Research and Planning Institute]: "Make the Permafrost an Ally: A Unique City Construction Experiment in Yakutsk"]

[Text] Permafrost is a strange phenomenon: in its normal condition, it is harder than concrete. But try to place an apartment house on this the hardest of foundations, and the permafrost will thaw from the heat of the dwelling; it grows soft, swells up, and sometimes even turns completely into a swamp. And the end result is that the building cracks, becomes warped, and collapses.

These bitter lessons of the North are well-known. Today all apartment houses built on permafrost are raised up on stilts so that the cold wind can play around the lower story, not letting the soil warm up from the building. The first such house on a "pillow of air" appeared in 1948 in Yakutsk, but now you will find them everywhere in the Far North; moreover, not only in our country, but abroad as well--in Alaska and Canada.

It is not easy to make the permafrost your ally. It is very vulnerable. Sometimes it is enough to simply damage the layer of moss which covers the earthen ice--to cross over it in an all-terrain vehicle let's say, since beneath the crumpled cover of growth the temperature conditions are disturbed, and melting begins; after a while first a polynia appears in this place; and this will expand year by year and turn into a thermal sink hole which "moves" across the tundra, further thawing its icy shores.

Today the builders use thermal pilings on which the new buildings are raised. There are pilings with thermal siphons, which are also used in building earth-fill dams, and the foundations to support electric power transmission lines.

The principle of maximum "ease in disposition" with permafrost also lies at the basis of the city-building experiment begun in Yakutsk. Here on the southwest fringe of the city is a large plot of land with an area of 800 hectares and a volume of over 50 million cubic meters of dirt which was deposited from the channel of the Lena, forming an embankment 6-7 meters high. On this "buffer" between the permafrost and man's economic activities

the first such mass housing construction project in the world's practical experience is beginning. The population of this housing complex will equal that of Yakutsk. Buildings of 12, 16 stories and more will be raised on the permafrost.

When engineers develop territories in the temperate climatic zone, hydraulic gradation is customary. But here, the permafrost is fragile. How will it behave in contact with the "warm" embankment; how will the cryogenic (frozen earth) processes be developed in the foundation; and what sort of properties will the ground possess? For these and many other questions it was necessary to find answers.

By assignment of GKNT [State Committee on Science and Technology] the Permafrost Institute of the Siberian Department, USSR Academy of Sciences; the NIIOSP [Scientific Research Institute for Foundations and Underground Structures]; LenzNIIEP [Leningrad Zonal Scientific Research and Planning Institute for the Basic Design and Experimental Planning of Residential and Public Buildings]; and the like, were enlisted for scientific-research and planning and designing operations. The leading organization is our Yakutsk scientific research affiliate of Zabaykalpromstroyniproekt, of Minvostokstroy [Ministry of Construction for Eastern Areas].

For conducting a full-scale operation, a proving ground with an area of 12 hectares was built up in the flood plain of the Lena. A thermally-balanced fixed base was erected on it and holes were bored, one of which is 100 meters deep. And here foundations were laid for several building designs, and for fragments of two-story buildings; and engineering-service lines were laid. Variants were examined wherein the built-up ground does not bear the weight of the foundation—it is transmitted directly to the underlayer of the natural foundation. The situation was studied in which the support occurs on the built-up and the natural layers, and it was observed how the embankment supports the entire load.

Electronic computers were used to calculate detailed methods for predicting the temperature conditions of the foundations, and an algorithm was developed for solving this problem quantitatively. Finally, mathematical models were created, which permit making a choice in favor of one type of construction or another. At the same time they made a very important conclusion: when selecting the method of using built-up earth for a foundation, one should give preference to the natural course of development of the cryogenic processes in the embankments. Engineering decisions should support the intensification of their tendencies, but in no case should it enter into competition with them.

The results of the research were examined and approved by the scientific-technical council of Gosstroy, USSR. And it was deemed expedient to begin a mass civil engineering development on built-up earth, erecting the first three experimental buildings, in order to conduct research on various types of foundations, develop the technology and determine the economic costs of construction, under natural conditions.

At the experimental building site, on which nearly 1.5 million cubic meters of earth has been built up, they are presently completing installation work on a five-story building erected on columnar foundations--on five-meter-long reinforced concrete pilings with sole plates. And another such standard 70-apartment building will stand on a field of pilings made from eight-meter-long reinforced concrete piles. This method is more suitable for the northern latitudes. And the third building will be raised on foundations of the surface type, which are completely new for the permafrost regions--on corrugated casings, which somehow vaguely resemble the expanded bellows of an accordion. We have high hopes for this last type of support. The heating supply is installed on narrow strips, and the sewer mains will be connected to a reservoir and flushed out.

Is it worthwhile to speak of how important the purity of the experiment is at this time? Unfortunately, the works at the building site (the general contractor is SMU-4 [Construction and Installation Section] of Glavyakutstroy) could hardly be called exemplary. The quality of the reinforced concrete structures received from local manufacture is not high. For this reason all the foundations of the first building (the columns and sole plates) were rejected and replaced. There were cracks in 120 of the pilings which had been driven in the foundation of the second building. As a result, they had to be dug up. And deviations from technology were committed in building up the embankment at the building site. Naturally, such a beginning can hardly fail to be disturbing.

And construction itself is getting off to a slow start. Of the 10.5 million rubles budgeted for the project, thus far only 3.3 million has been assimilated. And the period for completion of the project is only a year off.

The experiment in Yakutsk is for a special purpose. Permafrost is found in nearly half the territory of our country. The use of hydraulic gradation for preparing the engineering mains at the building site, and arrangement of a "zero" cycle opens broad prospects for mass housing construction in the Far North. Suffice it to say that other conditions being equal, this method is cheaper than the traditional by a factor of 1.5-3.0, and is 15 times less labor-intensive--which is especially important for these places where every pair of working hands counts.

Now the work on the experimental building site of the housing complex must be speeded up. To do this requires allocating specially-designated resources at full volume, at the earliest possible time, to finish the construction work.

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## CONSTRUCTION METHODS AND MATERIALS

### PROBLEMS OF BUILDING IN FAR NORTH REQUIRE SPECIAL RESEARCH

Moscow STROITEL'NAYA GAZETA in Russian 29 Apr 84 p 3

[Article by M. Khasanov, director of the Siberian Affiliate of the Industrial and Scientific Research Institute for Construction-Engineering Surveys, of Gosstroy USSR, candidate of geological and mineral sciences: "Honor the Ice Sphynx," under the rubric: "Economy Begins with Planning"]

[Text] Permafrost begins in Western Siberia at the approaches to the 67th parallel; the thickness of the permafrost strata ranges from 50 to 600 meters. Rapid development of productive forces is taking place here at the present time, and industrial, housing and civil engineering construction has expanded on a broad front. Development of oil and gas deposits is continuing. It is obvious that success in construction in the conditions of the North depends to a great extent on a skillful approach to permafrost.

Project surveyors admittedly play an important role in solving this problem. They are carrying out a large volume of work here, amounting to about 60 million rubles. But one cannot say that their practical activities are satisfactory. One of the reasons is that the surveys are conducted in a disconnected manner by nearly 70 organizations, the majority of which do not have the official right to do this.

As early as 1976, the circle of survey organizations was limited to a list approved by Gosstroy USSR and GUGK [Main Administration of Geodesy and Cartography], with the aim of improving the quality of the work and reducing the period for its completion. Violations of this document have become systematic in Tyumen Oblast. The proportion of the surveys carried out here by specialized subunits amounts to only one-fourth the total volume. The remainder are carried out by whomever takes it into his head to do so, right down to the very builders themselves, who maintain semilegal survey groups. Capable of handling this matter at the required level are Tyumen'tisiz [expansion unknown] of Gosstroy RSFSR, Giprotymenneftegaz [State Technical-Economic Research and Planning Institute, Tyumen' Oil and Gas Industry] of the Ministry of the Petroleum Industry, and SibPNIIS [Siberian Industrial and Scientific Research Institute for Construction-Engineering Surveys] of Gosstroy USSR.

At the present time in Western Siberia the prevailing method for selecting operational areas and developing general plans is to use topographic and aerial photo survey materials, without taking into consideration the engineering and geological conditions. Because of this the planners quite often suffer misfortunes. A typical example is the Farafont'evsk industrial zone at the Urengoy deposit. Setting about his tasks, the general project officer ignored the shortcomings in the survey data. And it was only at the stage of operational planning that it became clear that a number of the projects lay on thick icy areas with frozen upheavals which in the coming years could allow the ground to subside by as much as five meters. Consequently, in order to preserve the permafrost condition of the ground, significant additional expenditures were required.

One would think that in Western Siberia it would be expedient to create a specialized service for permafrost surveillance, which could operate under SibPNIIS as the main institute on problems of engineering-geological and geocryologic surveys for construction in Tyumen Oblast.

The chapters of SNiP [Construction Norms and Regulations] indicate that in especially complex conditions, engineering surveys should be conducted taking into consideration the supplementary instructions which were approved by Gosstroy USSR. But you see, practically the entire northern part of Tyumen Oblast falls under the complex category. What then? Should one turn to Gosstroy in every situation? Has not the establishment of regional instructions and recommendations, discussion of which began long ago, been delayed too long? This gives birth to numerous disputes on the question of what one may and may not do on permafrost ground; the period for coordinating the decisions is growing longer and, naturally, this makes it more difficult to develop the most lucrative northern mineral stores.

And there is another disturbing problem--the material base of the Western Siberian surveyors. It is well known that their basic work is determining the properties, composition and cryogenic construction of the rock. Study of these most important parameters is now done on a low level. The fact is that the test assays which are chosen must be dispatched hundreds of kilometers away--to Tyumen', Moscow, Leningrad and other cities where there are the proper laboratories. During transportation it is inevitable that the structure of the frozen rock is disturbed, and one can hardly rely completely on the results of such research. The need is obvious for organizing scientific-industrial laboratories on soil mechanics in direct proximity to the projects. These are especially needed on the Yamal Peninsula, in the city of Novyy Urengoy, and elsewhere in northern Tyumen Oblast.

The surveyors are very poorly supplied with equipment. They receive UGB-50 drilling units mounted on GAZ-66 trucks, which are not suited to low temperatures, nor to off-road operation. They have no all-terrain vehicles like the T-130, or other vehicles which have acquitted themselves well in the North.

Not a single VUZ is training surveying specialists for industrial construction for work on permafrost. In a sense, the people who are occupied in this business are self-educated, c amateurs, among whom one can find the widest variety of specialists. The capability exists to train surveyors in Tyumen' itself. The local industrial institute could concern itself with this. Naturally, the good offices of MinVUZ and Gosstroy RSFSR are needed for this.

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## CONSTRUCTION METHODS AND MATERIALS

### ECONOMIC ADVANTAGES OF USING GYPSUM MATERIALS, PRODUCTS

Moscow STROITEL'NYE MATERIALY in Russian No 3, Mar 84 pp 2-4

[Article by Yu. M. Vinogradov, deputy chief, USSR Gostroy Department of the Construction Industry, Structural Elements and New Materials, and G. A. Isakovich, department chief, USSR Gostroy Scientific Research Institute for Construction Economics: "Economic Effectiveness of the use of Gypsum Materials and Items in Construction"]

[Text] Gypsum binding agents and products based upon them are acquiring ever greater importance as effective construction materials. Their production is distinguished by low fuel and energy intensiveness, while the finished products have good operational properties. A number of the country's scientific research organizations have expanded and deepened their research on these materials. The experience accumulated in the production and use of gypsum materials, and the results from new developments are depicted in a series of articles which the editors have arranged to show the prospects for increasing the production of gypsum based materials and items, and for expanding their application range. Some of the articles are in this issue. In subsequent issues we will continue to publish articles showing promising manufacturing processes for high strength gypsum binding agents made from natural gypsum materials, for dry gypsum plaster mixes, experience in sheetrock production, in the manufacture and use of gypsum concrete wall panels and large blocks, including the products of the Krasnoufimsk plant for gypsum concrete items, and the possibility of using gypsum cement made from phosphogypsum. The articles will also reflect theoretical developments involving the estimation of gypsum binding agent and product quality, producing high-strength artificial gypsum stone, and other subjects.

Growth in the production and use of gypsum materials, products and structural elements is one of the large reserves for construction intensification, the reduction of material, energy and labor intensiveness of construction work, and for shortening the time needed to complete construction and installation work.

Thanks to the work of Soviet specialists, gypsum binding agents, which have been traditional building materials, have acquired a number of new qualitative properties, making it possible to substantially expand their range of application. This primarily applies to mixed gypsum cement-pozzoana and gypsum-lime-binding agents, having sufficient water resistance and good physical-mechanical characteristics for use as a base in the manufacture of gypsum concrete exterior enclosures in low rise construction, and in the installation of [toilet facility units] and partitions in facilities with high air humidity during operation.

Composite bonding agents based on gypsum with polymer additives have substantially increased the durability of gypsum stone (especially under tension and flexure) and thereby have made it possible to ensure the development of the formulas of dry mixes for poured floors, industrial thin layer decorative and soundproof panels with good architectural and aesthetic properties.

Modern achievements in gypsum materials technology have created the prerequisites for improvements in gypsum board and fiber items, in organizing the production of dry mixes for plastering work and the installation of seamless poured floored foundations, reducing the labor intensiveness of these operations at construction sites by 1.5-2 fold and sharply reducing the time they take.

The purposeful change in the broad range of the technological properties of gypsum mortars and concretes with the aid of modifying additives, fillers and organic and inorganic reinforcing fibers make it possible in principle to use highly mechanized and automated forming methods (casting, pressing, rolling, extrusion). This assumes the rational choice of decisions for the technological lines and equipment when developing production facilities for gypsum products and structural elements.

Scientific and technical progress in gypsum binding agents makes advisable a new approach to the development of this subsector of the construction materials industry in order to completely meet the needs of construction and other sectors for pregressive materials products and structural elements based on gypsum.

The production volumes and technical levels of our country's gypsum industry lag considerably behind similar industries in other technologically developed countries. In particular, this is reflected by indicators for gypsum production (tons per 1,000 people): in the USSR--18, the U.S.--59, England--60.7 and France--67.5.

Over the past 20 years the country's gypsum industry has practically not grown at all, while during the same time cement production increased 2-fold. When one takes into consideration that in a number of oblasts the use of gypsum binding agents to replace portland cement is technically and economically advisable, and that the production of 1 ton of gypsum uses 4.5-fold less fuel and energy than the production of 1 ton of cement, 2-fold less unit capital investments and a sharp (3-fold) reduction in the metal intensiveness of process equipment, it obviously becomes urgent to take

comprehensive large-scale technical, economic and organizational measures to considerably increase the production of gypsum products and structural elements substantially improve their quality and expand their assortment.

The country has large deposits of raw materials for gypsum production. In addition, the production of wet-process phosphoric acid annually results in 13 million tons of phosphogypsum being thrown into waste dumps (total supplies in such dumps exceed 100 million tons). It is not only economically, but also ecologically advisable to use these wastes to make gypsum cements.

Research on their economic effectiveness was conducted to determine the rational magnitudes of demand and the application range of the basic types of gypsum items and structural elements. In this research the indicators under comparison were the computed costs [privedennyye zatraty], and total labor and energy intensiveness. These included costs at all technological stages [peredel] for the manufacture of the binding agent, the products and structural elements, and expenditures of portland cement and metal.

The initial indicators of plant prime cost with comparable technical decisions were based upon actual data from representative enterprises, and in cases where certain types of new products were not industrially produced, the indicators for the consumption of raw materials, semifabricates, fuel-energy resources and labor outlays recommended by the leading institutes developing the technology for such products.

The magnitudes of unit capital investments for building production facilities for materials, products and structural elements were established from approved norms or sector average indicators. Outlays for the completion of construction-installation work correspond to the estimates in SNiP [Construction norms and regulations] 4.IV and YeRYe [Regional unified unit cost and wage rates] put into effect on 1 January 1984. These estimates were made for the country's Central Economic Region.

The widest use for gypsum items and structures is: partitions made in the form of small panels (600-800) x (300-400) x 80 mm; large, room-size panels; panels for toilet facility partitions and sheetrock or gypsum fiber board panels in factory or building-site produced-wooden and metal frames. With an average annual use of internal walls and partitions in construction totalling about 140 million square meters (100 percent), gypsum based panels account for 30 million square meters (21.5 percent), brick—53 million (37.8 percent) and heavy and light concrete—22 million (15.7 percent).

Gypsum partitions are more effective than brick or ferroconcrete ones for all economic indicators, especially for full labor and energy costs (See Table 1). An increase in the use of gypsum partitions and internal walls to at least 2 fold its present level (which is completely in accordance with the possibilities of planning decisions in residential-civil and industrial construction) will make it possible to free at least 30,000 of the average annual number of workers (mainly from construction operations), save about 300,000 tons of standard fuel and more than 500,000 tons of cement. It is especially important to note that this effect is attained with less capital

investments for expanding the production of products and structural elements for partitions.

The problem of increasing the water resistance of gypsum binding agents and concretes based upon them is being successfully solved by collectives of specialists at the MISI [Moscow Construction Engineering Institute] imeni V. V. Kuybyshev (gypsum cement-pozzolana binding agent--GCPB) and at the Urals Polytechnical Institute (gypsum lime-slag binding agent--GLSB). The use of these agents substantially expands the sphere of application of gypsum concretes and mortars. These uses include external walls, mainly in low rise construction and rural areas.

Table 1.

<u>Partition and Internal Wall Structures</u>	<u>Total Unit Capital Investments (rubles/yr)</u>	<u>Computed Costs (1,000 rubles)</u>	<u>Full Labor Inten- siveness (person hours)</u>	<u>Full Energy Inten- siveness (Kg st. Fuel)</u>	<u>Use, Kg</u>	
					<u>Cement</u>	<u>Metal</u>
Gypsum concrete panels 80 mm thick	5.6	5.27	0.7	8	--	1
600x300x80mm Gypsum panels	9.25	4.1	2.2	8.6	--	--
Interroom sheet- rock with mineral wool sound insulation						
On-site fabricated metal frame	4.3	5.8	1.55	3.35	--	1.8
Plant fabricated wooden frame	3.8	7.61	0.87	1.55	--	--
Plastered brick, ½ brick thick	7.5	6.8	4.3	15	10	--
Heavy concrete panel 80mm thick	7.2	6.66	2.8	19	30	3

Note: Indicators per 1 m<sup>2</sup> of structure

Noncement GLSB was used in the 1940's to make wall stond and houses in Ufa, Sterlitamak and Sverdlovsk which are still in use. In 1976 in Sverdlovsk Oblast the Roskolkhozob'yedineniye [All-Russian Kolkhoz Association] put the

Krasnoufinsk gypsum concrete products plant into operation. It annually produces 60,000 square meters (24,000 cubic meters) of exterior wall blocks in 60 types and sizes.

More than 1,000 rural projects have been built using items from the plant. These include: single story two apartment housing, animal facilities, grain storage units, commercial buildings, etc. According to the people operating these buildings, their quality is completely satisfactory. Under these conditions it is of interest to compare the techno-economic indicators of gypsum concrete house walls with other design solutions, using actual production and use indicators (See Table 2).

Economic analysis shows that for low rise construction gypsum concrete walls are 10-50 percent more effective than clay brick walls and claydite-concrete panels. They are 30-60 percent less energy intensive than the latter. The full labor intensiveness of walls made from small gypsum concrete blocks is also lower than that of other structural elements.

Table 2.

<u>Wall Structure*</u>	<u>Total Unit Capital Investments (rubles/yr)</u>	<u>Computed Costs (1,000 rubles)</u>	<u>Full Labor Inten- siveness (person hours)</u>	<u>Full Energy Inten- siveness (Kg. st. Fuel)</u>	<u>Use, Kg</u>	
					<u>Cement</u>	<u>Metal</u>
Gypsum concrete panels and large GLSB blocks, 40 cm thick, 45 percent void	40	18.8	3.3	4.8	--	2.2
39x19x19cm gypsum concrete blocks	25	10.75	3.5	48	--	--
51 cm thick clay bricks**	27.2	20.81	5.42	69	15	--
64 cm thick silicate brick**	20	18.61	3.9	54	15	--
40 cm thick 1,100 kg/m <sup>3</sup> claydite concrete wall panel	47	21.65	3.62	115	120	7

\* All thicknesses of external walls were determined for economically optimal heat transfer resistance

\*\* With mortared joints and plastered internal surfaces.

Note: Indicators per 1 m<sup>2</sup> of solid wall.

A very important factor is the recognition of the economic advisability of developing the production of gypsum concrete wall materials primarily in the form of small blocks, which require considerably smaller unit capital investments and current outlays, while transport and installation do not require special equipment.

Practical experience in the production and use of toilet facility units made from GSPB has convincingly proven their economic advantages over ferroconcrete structures. Calculations show a 60 ruble economic effect per unit using water resistant gypsum, while labor outlays are reduced by 16 person hours, fuel and energy costs by 155 kg of standard fuel; up to 630 kg of cement and 25 kg of reinforcing steel are saved.

It should be noted that there are a number of shortcomings in the casting technology that enterprises use for gypsum toilet facility units. The primary one is the high initial moisture of gypsum concrete, leading to shrinkage deformation and cracks during these structures' manufacture and operation. There are proven measures for increasing the strength, water resistance and longevity of the units which should be very rapidly introduced. There should simultaneously be a considerable expansion in gypsum concrete toilet unit production. At present they only account for about 10 percent of total output of units used in large panel housing construction. This also applies to ventilation modules.

Their good aesthetic qualities and simplicity of manufacturing make gypsum items irreplaceable for finishing the interiors of various types of building. The industry produces several types of gypsum finishing materials. The first place with regard to production volume is held by items based on sheets of dry gypsum plaster. These have good appearance and sound insulation properties provided by perforations, panel and design facings.

The manufacture of such items requires much manual labor. Therefore their prime cost is 3-6 fold higher than that of the raw materials. The low quality of the dry gypsum plaster used also has an effect. There also has been no solution to the problem of supplying plants with self-sticking panel materials.

Sound insulation sheet production is based upon machine technology using two methods of fabricating gypsum housing: "face below" distributing the material in the form at through pressing at low unit pressure (about 1 kg/cm<sup>2</sup>), and "face above" using casting mixtures and subsequent grinding of the outer face. The first method results in considerably better quality. The installation of the padding material and mineral wool (the sound insulation layer) and the glueing of the aluminum foil are done manually.

Decorative gypsum cast panels (reliefs) are manufactured by a conveyor method (developed by VNIISTrom, imeni P. P. Budnikov [All Union Scientific Research Institute for Building Materials and Structural Elements] and manually on stands. The first method, using rubber forms, which provide for higher mechanization levels, is for panels to finish walls. In order to

convert to the production of ceiling panels it will be necessary to have equipment for making fasteners.

The main tasks in the production of decorative panels are the development of modern equipment and the reduction of product weight.

The use of dry gypsum plaster mixtures can have a large economic effect. Their production has been organized at highly mechanized grinding-mixing units with a capacity of 300,000-400,000 tons annually. This is enough to finish about 20 million square meters of surface to an average thickness of the plaster layer of 20 mm.

By using gypsum mixes instead of cement-lime mortars, the labor productivity of the basic workers employed in plastering work increases 2 to 3-fold. Simultaneously, there is a considerable reduction of transport costs and losses of mortars. It has been established that the use of dry gypsum mixes instead of cement-lime mortars will permit one, per 100 m<sup>2</sup> of plastered surface, to obtain a savings of 33 rubles, to reduce labor intensity by more than 30 person-hours, to cut fuel consumption for the production of the raw materials by 170 kg of standard fuel and to refrain from using up to 600 kg of cement.

Dry gypsum mortars can also be effectively used to pour sub-floors in place of monolithic concrete.

The solution to problems in the extensive use of phosphogypsum is of special importance to the gypsum industry's development. It has now been shown to be technically possible and economically advisable to use phosphogypsum in the following basic areas: in agriculture--for the chemical improvement of alkaline soils; in industry--to obtain sulphuric acid and cement (or lime); as an additive in the production of paper, replacing kaolin; in construction--for the making of cement and gypsum binding agents.

Phosphogypsum is still used only in insignificant amounts (about 200,000 tons annually) for construction needs. The main reason is that it cannot be used in its natural form, while up until recently bringing it up to standards appropriate for use involved sizable costs. In contrast to natural gypsum stone, phosphogypsum contains residues of phosphoric acid and flourine compounds which should be washed out or neutralized.

Using the Babcock--Buttner-Schild-Haas (FRG) technology for obtaining high strength gypsum from phosphogypsum obtained at the end of 1982, the Minudobreniye [Min. of Mineral Fertilizer Production] PO in Voskresensk had unit capital investments exceeding 40 rubles per ton of binding agent, close to the capital costs for cement.

The VNIItrom imeni P. P. Budnikov and the IONKH [General and Inorganic Chemistry Institute] of the Armenian SSR Academy of Sciences have developed technology for obtaining high-strength gypsum with increased water resistance requiring only 20 rubles of capital investments per ton of binding agent (with a facility having a 360,000 ton annual capacity). It is planned to organize

phosphogypsum item production using this method at the Uvarov and other chemical plants.

Lithuanian SSR Gostroy's Scientific Research Institute for Construction and Architecture has developed, and an interdepartmental commission has approved a process for obtaining construction gypsum (the beta modification) from phosphogypsum. In contrast to other processes this one will neutralize, rather than was and remove harmful ingredients, considerably simplifying and reducing the cost of processing phosphogypsum. In 1985 it is planned to introduce capacity for the production of 60,000 tons of gypsum at the Kedaynyay chemical plant in the LiSSR.

The high economic efficiency of gypsum materials and items, the labor and energy savings from their production and use instead of cement concretes and mortar, as well as the comparatively low capital intensiveness per unit of final product make it advisable for interested USSR ministries and departments to work out a system of technical, economic and organizational measures, the implementation of which would substantially increase production volume, expand assortments and improve the quality of progressive materials, products and structures made from gypsum binding agents in order to completely satisfy construction's needs for them.

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